2-21-95-F-114

SUMMARY
BIOLOGICAL OPINION AND CONFERENCE OPINION FOR EXISTING AND PROPOSED ACTIVITIES BY THE MARINE CORPS AIR STATION - YUMA IN THE ARIZONA PORTION OF THE YUMA TRAINING RANGE COMPLEX

Date of Opinion: April 17, 1996

Action Agency: Marine Corps Air Station - Yuma (MCAS - Yuma)

Project: Military use conducted or authorized by MCAS - Yuma on the Barry M. Goldwater Range, including ongoing and proposed actions, including proposed changes to military flights over Cabeza Prieta National Wildlife Refuge; ongoing flights over the Goldwater Range; and operation of various training facilities such as landing strips, a rifle range, targets, a parachute drop zone, a transmitter/telemetry system, and ground support areas. Most activities addressed occur on the western half of the Goldwater Range. The Yuma Training Range Complex includes project features in California at the Chocolate Mountains Aerial Gunnery Range. Actions in California are the subject of a consultation between MCAS - Yuma and the Service's Carlsbad Field Office.

Location: Southwestern Maricopa County and southeastern Yuma County, Arizona.

Listed and Proposed Species Affected: Sonoran pronghorn, *Antilocapra americana sonoriensis*, a federally listed endangered species; and the flat-tailed horned lizard, *Phrynosoma mcallii*, proposed for Federal listing as a threatened species. No critical habitat has been designated or proposed for either species. The biological opinion also addresses findings made by MCAS - Yuma that the proposed action is not likely to adversely affect the lesser long-nosed bat, *Leptonycteris curasoae yerbabuenae*, (endangered) and is not likely to jeopardize the cactus ferruginous pygmy-owl, *Glaucidium brasilianum cactorum*, (proposed endangered).

Biological Opinion: Not likely to jeopardize either the flat-tailed horned lizard or the Sonoran pronghorn. The Service concurs that the action is not likely to adversely affect the lesser long-nosed bat and conditionally concurs with a not likely to jeopardize finding for the cactus ferruginous pygmy-owl.

Incidental Take Statement:

Level of take anticipated: Anticipated take includes 23 flat-tailed horned lizards per year in the form of direct mortality, 10 flat-tailed horned lizards per year in the form of harm resulting from habitat loss or degradation, and an undetermined number of flat-tailed horned lizards in the form of harassment resulting from moving animals out of harm's way. Also anticipated is take of one Sonoran pronghorn per ten years in the form of direct mortality, and an undeterminable number of Sonoran pronghorn in the form of harassment associated with low-level flights. In regards to the Sonoran pronghorn, exceeding this level of take would require reinitiation of formal consultation.

Reasonable and Prudent Measures: The biological opinion presents three measures for reducing incidental take. In regards to measures that address the Sonoran pronghorn, implementation of these measures through the terms and conditions are mandatory.

Terms and Conditions: Thirty-six mandatory terms and conditions are included to implement the reasonable and prudent measures. They include a variety of measures to reduce incidental take, such as avoidance of taking individual animals (including moving animals out of harm's way, when necessary), environmental education for military and other users of the Goldwater Range, designation of biological monitors, minimizing off-road vehicle activity, maximizing protection of Sonoran pronghorn and flat-tailed horned lizard habitat, and researching effects to pronghorn at targets used during Weapons Tactics Instructor courses and developing appropriate mitigating measures. Measures are also included in regards to monitoring and reporting of take and habitat loss.

Conservation Recommendations: MCAS - Yuma should take the following actions: 1) continue to support and fund basic research on the Sonoran pronghorn, as well as specific studies to evaluate the effects of low-level aircraft flights on this species; 2) continue to fund and support research on the flat-tailed horned lizard that will contribute to improved management of the species and its habitat; 3) continue to participate in the preparation of a Rangewide Management Strategy and Conservation Agreement for the flat-tailed horned lizard and implement the strategy and agreement upon their completion; and 4) develop and provide to the Fish and Wildlife Service maps showing noise contours resulting from low-level flights on Cabeza Prieta National Wildlife Refuge. Implementation of conservation recommendations is discretionary.

United States Department of the Interior
Fish and Wildlife Service
Arizona Ecological Services Field Office
2321 W. Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
(602) 640-2720 Fax (602) 640-2730

In Reply Refer To:

AESO/SE
2-21-95-F-114

April 17, 1996

J.D. Cox, Major
U.S. Marine Corps
Director of Range Management, SOMS
Marine Corps Air Station
P.O. Box 99100
Yuma, Arizona 85369-9100

SUBJECT: Biological Opinion and Conference Opinion for Existing and Proposed Activities by the Marine Corps Air Station - Yuma in the Arizona Portion of the Yuma Training Range Complex

This biological opinion and conference opinion respond to your request for initiation of formal consultation/conferencing with the Fish and Wildlife Service pursuant to section 7 of the Endangered Species Act (Act) of 1973 (16 U.S.C. 1531-1544), as amended. Your request was dated October 13, 1995, and received by us on October 19, 1995. At issue are impacts resulting from proposed and ongoing activities by the Marine Corps Air Station - Yuma (MCAS - Yuma) on the Barry M. Goldwater Range, Yuma and Maricopa counties, Arizona that may affect the Sonoran pronghorn, *Antilocapra americana sonoriensis*, and the flat-tailed horned lizard, *Phrynosoma mcallii*. The Sonoran pronghorn is listed as an endangered species; the flat-tailed horned lizard is proposed for listing as threatened. Critical habitat has not been designated or proposed for either species. Your request for initiation of consultation/conferencing also found that ongoing and proposed actions are not likely to adversely affect the lesser long-nosed bat, *Leptonycteris curasoae yerbabuenae*, an endangered species, and are not likely to jeopardize the cactus ferruginous pygmy-owl, *Glaucidium brasilianum cactorum*, proposed as an endangered species. These findings are addressed herein under the section "CONCURRENCES" (pages 60-64) .

This biological/conference opinion was prepared using information from the following sources: your October 13, 1995, request for initiation of consultation, the biological assessment for the proposed action (Dames and Moore 1995); the draft Environmental Impact Statement (dEIS) for the Yuma Training Range Complex (YTRC)(MCAS - Yuma 1995); informal consultation between our staffs; information developed and exchanged at a February 22, 1996, meeting among our staffs and members of the Sonoran Pronghorn Core Working Group; and our files. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern, the effects of the action, or

other subjects addressed herein. A complete administrative record of this consultation is on file in this office.

In this biological/conference opinion the Service finds that the effects of proposed and ongoing activities by the U.S. Marine Corps on the Goldwater Range are not likely to jeopardize the continued existence of either the Sonoran pronghorn or the flat-tailed horned lizard. Thirty-six terms and conditions are described to reduce the possibility of take associated with the proposed action.

CONSULTATION HISTORY

Informal consultation on the proposed action began on May 17, 1993, with the publication in the Federal Register of a notice of intent to prepare an EIS on the use of the YTRC. A coordination meeting at which the project was described and discussed was held on May 27, 1993, in Phoenix among various Service offices, MCAS - Yuma, the Bureau of Land Management, and Arizona Game and Fish Department. Alternatives included actions to improve training procedures, develop new training facilities, and reconfigure airspace in the western portion of the Goldwater Range, Arizona, and at the Chocolate Mountains Aerial Gunnery Range, Imperial County, California. A second coordination meeting between the Service and MCAS - Yuma was held in Phoenix on June 24, 1993. An administrative dEIS was distributed to the Service and other agencies and interested parties in July, 1994. This office submitted comments to MCAS - Yuma on the administrative dEIS in a letter dated August 5, 1994. Comments were from all concerned Service offices in Arizona, including this office and the Cabeza Prieta, Kofa, Cibola, Bill Williams, and Havasu National Wildlife Refuges (NWRs). Review and comment on project features in California were coordinated by the Service's Ecological Services - Carlsbad Field Office in California. MCAS - Yuma responded to our August 5, 1994, letter in a correspondence dated September 27, 1994. In a memorandum to the Carlsbad Field Office, dated October 19, 1994, our office volunteered to take the lead on a programmatic consultation for the YTRC, including proposed activities in both Arizona and California. In a memorandum dated November 8, 1994, the Carlsbad Field Office agreed to our office taking the lead. A third coordination meeting was held among the various concerned Service offices in Arizona and MCAS - Yuma on November 9, 1994. The results of that meeting were summarized in a memorandum from Dames and Moore to the meeting participants, dated December 6, 1994. Other scoping and coordination meetings with the public and other agencies were also held to receive comment on and to discuss the proposals (MCAS - Yuma 1995).

Separate draft biological assessments addressing proposals in the Arizona and California portions of the YTRC were received by this office on December 8, 1994, accompanied by a letter from MCAS - Yuma asking for our review and comment. As agreed upon in previous discussions, the draft biological assessment for actions in California were forwarded to the Carlsbad Field Office for their review. Our comments on the draft biological assessment for the Arizona portion of the YTRC were sent to the Southwest Division, Naval Facilities Engineering Command, in a letter dated February 3, 1995. This letter included comments from the Cabeza Prieta NWR as well as comments from this office. The final biological assessment was received in this office with the October 13, 1995, request for initiation of

consultation/conferencing. In addition to activities described in the dEIS, the biological assessment also included proposed installation of 17 new threat emitters on the Tactical Aircraft Combat Training System Range within the Goldwater Range.

Because the finalization of the two biological assessments (Goldwater Range, Arizona, and the Chocolate Mountains Aerial Gunnery Range, California) were on different timetables, separate consultations were initiated for the California and Arizona portions of the YTRC. Consultation on actions in California were initiated in mid-1995 with the Carlsbad Field Office. All proposed activities in Arizona are addressed in this biological opinion. The two opinions address different species: Mojave population of the desert tortoise on the Chocolate Mountains Aerial Gunnery Range versus Sonoran pronghorn and flat-tailed horned lizard on the Goldwater Range. Thus, effects of the action in regards to listed and proposed species are easily separated at the state line.

During consultation, the Service informally requested from Bill Fisher (Naval Facilities Engineering Command, Southwest Division, San Diego, CA, January, 1996), and promptly received, clarifications on the proposed action. The Service coordinated informally with Cabeza Prieta NWR in regards to effects of the proposed action on the Sonoran pronghorn, and Service representatives met with the Sonoran Pronghorn Core Working Group on February 22, 1996 to discuss the proposed action. At that meeting, MCAS revised proposed low-level helicopter flight routes and use of two stinger team operating areas to reduce potential adverse effects to the pronghorn. Further revisions in the helicopter corridors were made during a conference call on March 7, 1996, among staff from this office; Laura Thompson-Olais, Cabeza Prieta NWR; John Hervert, Arizona Game and Fish Department, Yuma; and Ron Pearce, MCAS - Yuma. One final change was made in the corridors on April 11, 1996, in response to concerns expressed by the Service about possible adverse effects to the lesser long-nosed bat.

The Service and MCAS - Yuma have previously consulted informally on some aspects of the proposed action, including AV-8B helicopter activities (consultation log #2-21-89-I-195), and Weapons Tactics Instructor (WTI) course (#2-21-88-I-46, #2-21-88-I-48, #2-21-90-I-180). In regards to AV-8B activities, the Service reviewed an environmental assessment on proposed activities and recommended that MCAS - Yuma initiate formal consultation. Informal consultation on the WTI course consisted of coordination and review of an environmental assessment addressing WTI (#2-21-87-I-126), a request for a species list by MCAS - Yuma and transmittal of that list to MCAS - Yuma by the Service (#2-21-88-I-46), a concurrence by the Service that the proposed WTI course would have no effect on the Sonoran pronghorn (#2-21-88-I-48), and a request for informal consultation from MCAS - Yuma and a reply from the Service for more information on the proposed action (#2-21-90-I-195).

BIOLOGICAL OPINION

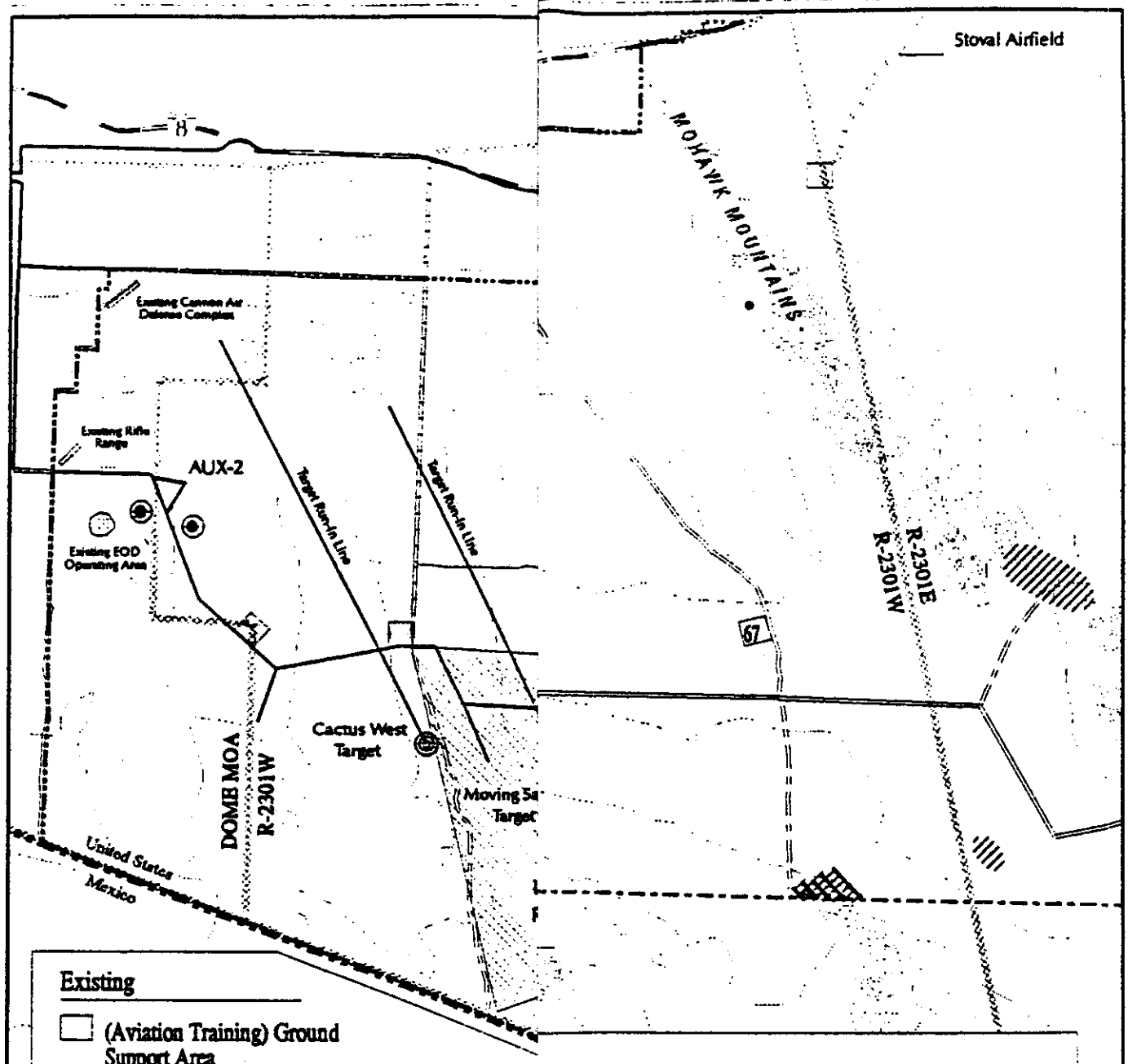
DESCRIPTION OF PROPOSED ACTION

By letter of agreement with the Air Force, the MCAS - Yuma is the primary military manager and user of the western portion of the Goldwater Range (R-2301W - see Figure 1). With one exception, all of the ground-based activities of the Marine Corps addressed in this opinion are conducted under airspace R-2301W of the Goldwater Range, which includes Cabeza Prieta NWR. Nearly all overflights authorized by MCAS are conducted within the R-2301W airspace, but a small number also use the R-2301E, R2304, and R-2305 airspaces managed by the Air Force. High-elevation flights (7,500 to 20,000 feet elevation) also occur over airspace in northwestern Yuma County and southern La Paz County (Figure 1-2 of MCAS - Yuma 1995). This biological/conference opinion only addresses activities funded, authorized, or carried out by MCAS - Yuma in support of the Yuma Training Range Complex. As required by 50 CFR 402.02 the "effects of the action" must include the effects of actions interrelated and interdependent to the action under consultation. Thus, those interrelated and interdependent actions and their effects are also discussed herein.

The purpose of Marine Corps activities in the Goldwater Range is to optimize training for aviation and aviation-associated support activities. Activities at the Goldwater Range provide training in six categories, including 1) anti-air warfare, 2) offensive air support, 3) assault support, 4) aerial reconnaissance, 5) electronic warfare, and 6) control of aircraft and missiles. The scope of training activities ranges from development of individual aircrew skills to complex tactical exercise scenarios involving a variety of aircraft and associated ground troops. The following descriptions of existing and proposed actions supporting these training activities are taken from Dames and Moore (1995), MCAS - Yuma (1995), and discussions among our staffs and personnel from Southwest Division:

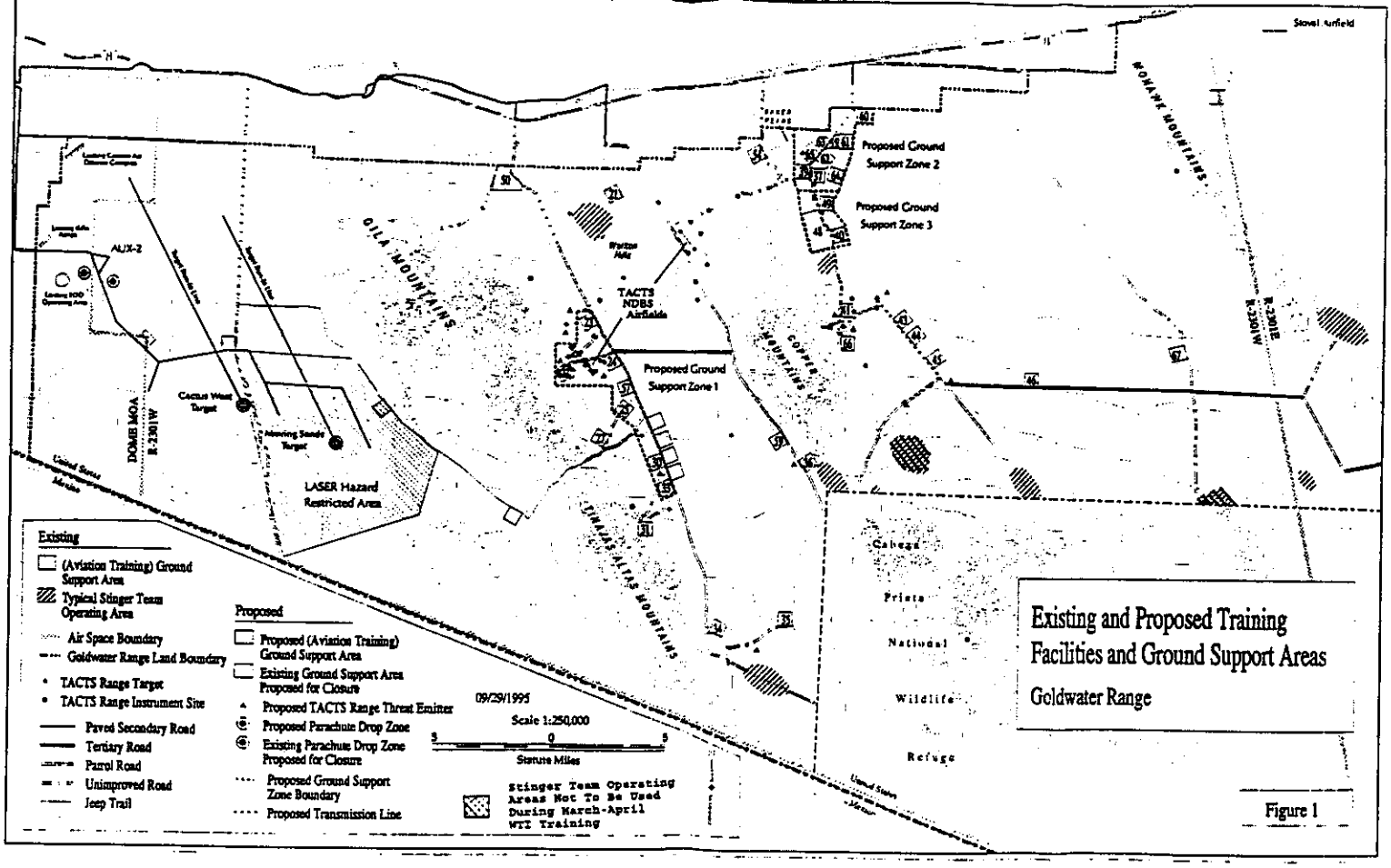
1. AUX-2 Airfield Complex

   Auxiliary Airfield-2 (AUX-2) supports training in forward airfield operations and related functions. AUX-2 consists of three 4,400-foot long asphalt runways in the shape of an equilateral triangle. Adjacent to the east-west runway is a landing control tower resembling the deck and control island of a U.S. Navy Landing Helicopter Assault ship. The northeast-southwest runway, known as the tactical landing zone, is used to train C-130 transport aircrews in landings and take-offs from unimproved surfaces. Helicopter crews use AUX-2 and the surrounding area for flight training at night with night-vision goggles. AUX-2 is also used by these aircrews and occasionally by AV-8B aircrews as a forward arming and refueling point. Located adjacent to AUX-2 is a tow banner drop area for the controlled release of aerial-towed practice gunnery targets.



isting and Proposed Training
cilities and Ground Support Areas
ldwater Range

Figure 1


Stovall Airfield
Proposed Ground Support Zone 2
Proposed Ground Support Zone 3
Proposed Ground Support Zone 1
TACTS NDBS Airfields
AUX-2
OGLA MOUNTAINS
COPPER MOUNTAINS
CHIRIACO SUMMIT MOUNTAINS
MOHAWK MOUNTAINS
R.23W.
R.23W.
DOME MOA
R.23W.
Cactus Wash Target
Moving Sands Target
LASER Hazard Restricted Area
Cabeza Prieta National Wildlife Refuge
Existing
(Aviation Training) Ground Support Area
Typical Stinger Team Operating Area
Air Space Boundary
Goldwater Range Land Boundary
TACTS Range Target
TACTS Range Instrument Site
Paved Secondary Road
Tertiary Road
Parrel Road
Unimproved Road
Jeep Trail
Proposed
Proposed (Aviation Training) Ground Support Area
Existing Ground Support Area Proposed for Closure
Proposed TACTS Range Threat Emitter
Proposed Parachute Drop Zone
Existing Parachute Drop Zone Proposed for Closure
Proposed Ground Support Zone Boundary
Proposed Transmission Line
09/29/1995
Scale 1:250,000
5 0 5
Statute Miles
Stinger Team Operating Areas Not To Be Used During March-April WTI Training
Existing and Proposed Training Facilities and Ground Support Areas
Goldwater Range
Figure 1

2. Moving Sands and Cactus West Targets

These targets support instruction in precision air-to-ground bombing. Both target complexes have bull's eye type bombing targets with a current impact radius of 1,500 feet. Both include air-to-ground rocket, bomb, and strafing targets. The Moving Sands complex also contains laser targets and a Mobile Land Target. The latter is a remote-controlled movable target. MCAS - Yuma has maintained cleared run-in lines, approximately 11 miles in length, to guide pilots to the targets. Ordnance delivery to the targets is limited to inert ordnance only. Inert bombs of up to 1,000 pounds and inert rockets are authorized, as well as the use of laser target designation. Explosive ordnance disposal (EOD) sweeps, including target area and run-in line maintenance, clearing, and grading, are conducted as often as quarterly on both target complexes.

3. Parachute Drop Zone

A parachute drop zone, located near AUX-2, is used to receive training parachute cargo drops from C-130 transport aircraft. Cargo pallets are recovered from the drop zone with a tactical forklift designed to operate on rough ground.

4. Explosive Ordnance Disposal Operating Area

The EOD Operating Area, located approximately 1.5 mile south-southwest of AUX-2, is an authorized location for disposal of ordnance. The site is accessed via a road from AUX-2 and consists of an open burn area, a class A and B detonation area, and a white phosphorus detonation area. Approximately 6.5 mi^2 surrounding the operating area is designated as restricted to entry for safety purposes.

5. Rifle Range

A 30-lane rifle range, located at the entrance to the Goldwater Range at County 19th, is used for small arms training by Marines stationed at MCAS - Yuma.

6. Cannon Air Defense Complex

Located at the northwest corner of the Goldwater Range, just off County 14th, this complex is the headquarters, training, and maintenance site for the 1st Light Anti-aircraft Missile Battalion stationed at MCAS - Yuma. Personnel are trained in the operation of HAWK phase III anti-aircraft missile systems using simulations. No missiles are launched from this site.

7. Tactical Aircrew Combat Training System (TACTS)

TACTS is a transmitter/telemetry system used for training in aerial combat to track and record the flight performance of up to 36 aircraft. The system can also simulate electronic air warfare conditions and electronically track and score simulated air-to-ground strikes. The TACTS system includes a master tracking and relay site at Baker Peaks, eight remote tracking sites, 19 threat emitters, and 112 passive tactical target sites that present simulated tactical targets to aircrews. Threat emitter sites consist of eight by 10-foot concrete pads adjacent to roads where portable electronic warfare equipment emits simulated tracking and targeting radar associated with enemy surface-to-air missiles.

8. Ground Support Areas

Ground support areas are located primarily in R-2301W where Marine Corps ground units conduct land-based air control, air defense, electronic warfare, communications, forward area helicopter refueling and rearming, as well as other functions to help create a complex air to ground battlefield. Forty-one existing ground support areas are located in the eastern land area underlying R-2301W. Most ground support areas are less than 0.39 mi^2. In total, they cover about 19.6 mi^2. An additional ten areas are established specifically as locations for using non-firing Stinger, shoulder-fired anti-aircraft missiles during Weapons Tactics Instructor (WTI) courses held primarily in March-April and October-November of each year. Stinger teams use High-Mobility Multipurpose Wheeled Vehicles (HMMWVs) on roads and are authorized to park off-road within 25 feet of roads. They then move on foot to sites where aircraft can be spotted. Stinger teams may use any area of the Goldwater Range (exclusive of Cabeza Prieta NWR). During the February 22, 1996, meeting among staff from MCAS, Southwest Division, the Service, and the Sonoran Pronghorn Core Working Group, MCAS - Yuma agreed not to use two Stinger Team Operating Areas during the March-April WTI course to reduce adverse effects to Sonoran pronghorn (Figure 1). In addition to the 41 ground support and 10 stinger missile sites, the Marine Corps also use Stoval Airfield underlying R-2301E as a forward arming and refueling point. The Stoval Airfield is the one existing location where ground-based Marine Corps activities occur on the Goldwater Range outside of the R-2301W airspace.

add
use here?

9. Military Road Use

Within R-2301W, roads have been identified and designated for military use. All roads shown on Figure 1 are approved for military use with the exception of jeep trails. The road system includes 237 miles of designated routes.

10. Overflights of the Goldwater Range, particularly airspace R-2301W

Approximately 21,000 training flights per year are carried out in R-2301W. Fixed-wing aircraft use is conducted throughout the year. Helicopter use occurs mostly from January through March and in September and October. Most fixed-wing sorties[1] occur during the day. Approximately 60 percent of helicopter sorties are flown during the day. Approximately 18, 20, 23, and 39 percent of all fixed-wing flight time occurs at 200 to 1,500 feet above ground level (AGL), 1,500 to 5,000 feet AGL, 5,000 to 10,000 feet AGL, and above 10,000 feet AGL, respectively. All helicopter flights occur between 50 and 1,500 feet AGL. Most supersonic flights occur above 5,000 feet. Low-level (200 to 1,500 feet AGL for fixed-wing, 50 to 1,500 feet for helicopters) flights may occur anywhere at any time within the Goldwater Range exclusive of Cabeza Prieta NWR. On the Refuge, low level flights are restricted to specific corridors and holding areas. Two corridors and two holding areas exist for fixed-wing aircraft and 11 corridor segments exist for helicopters. These corridors and holding areas are used only during WTI exercises, typically in October-November and March-April. Aircraft enter and exit the Cabeza Prieta NWR at specific points in the corridors. During WTI courses, aircraft use portions of 2301E on the eastern half of the Goldwater Range, including the WTI corridors on the Cabeza Prieta NWR and areas such as the South, North, and East tactical ranges. Existing flight corridors over the Refuge are shown in Figures 2 and 3.

11. HAWK FIREX

HAWK FIREX is a live-fire exercise designed to validate the performance of HAWK missiles and associated equipment. The exercise is typically conducted once annually, but has occurred as often as three times per year. Live HAWK missiles are fired from a site near Baker Peaks at remotely-piloted drones flown over the R-2301W and R-2301E airspaces. The direction of fire is to the southeast with impact usually occurring over the Mohawk Valley, north of Cabeza Prieta NWR. HAWK missiles either strike their airborne targets or are detonated in air.

12. Early Warning Control Training

This training provides personnel in a Marine Air Control System with initial and recurrent training experience necessary to deploy to tactical locations and to conduct combat operations. The training occurs in ground support areas,

---

[1]A sortie is defined as one aircraft conducting a single flight. Sorties include the use of any type of aircraft at any altitude of flight.

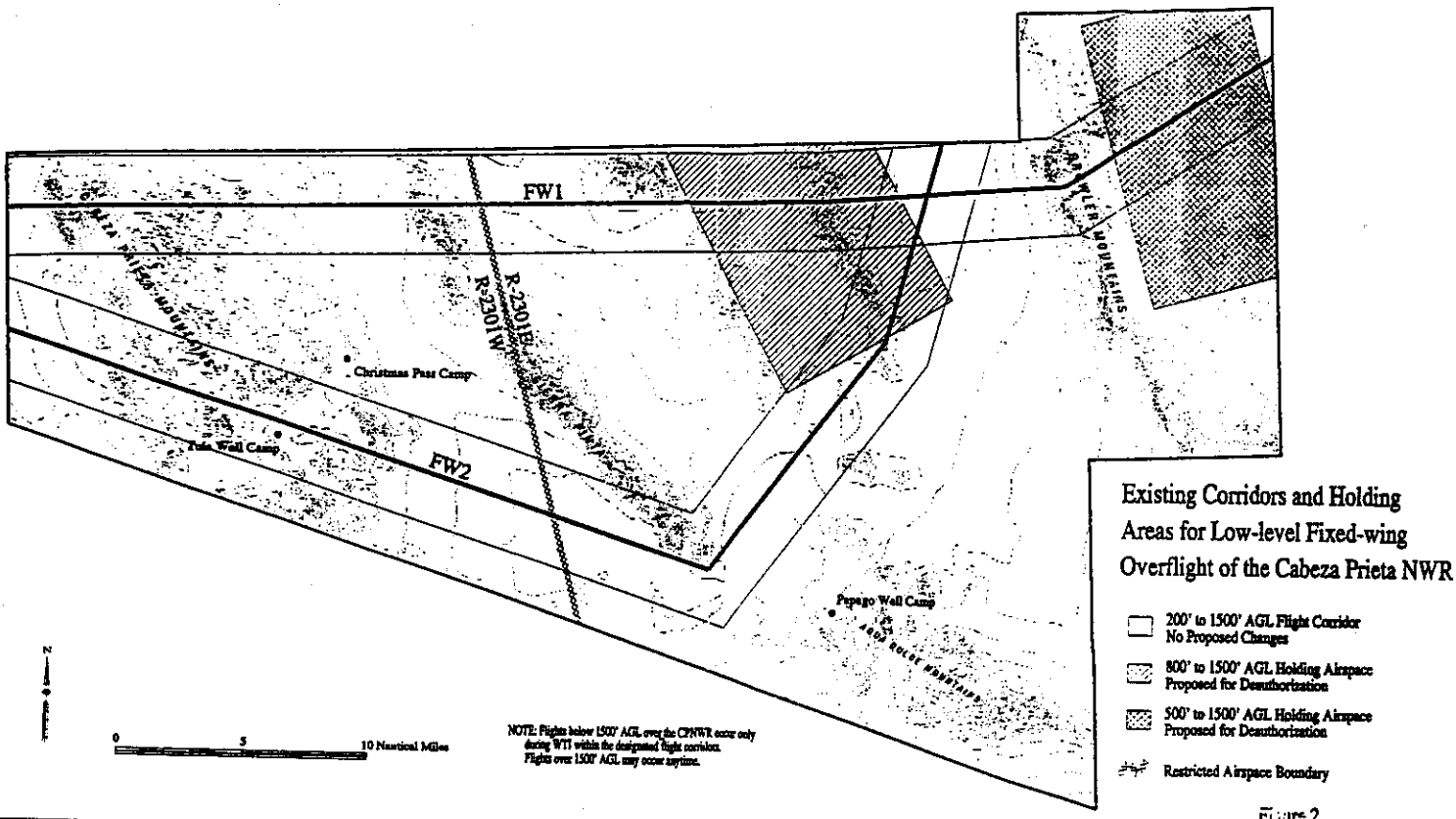
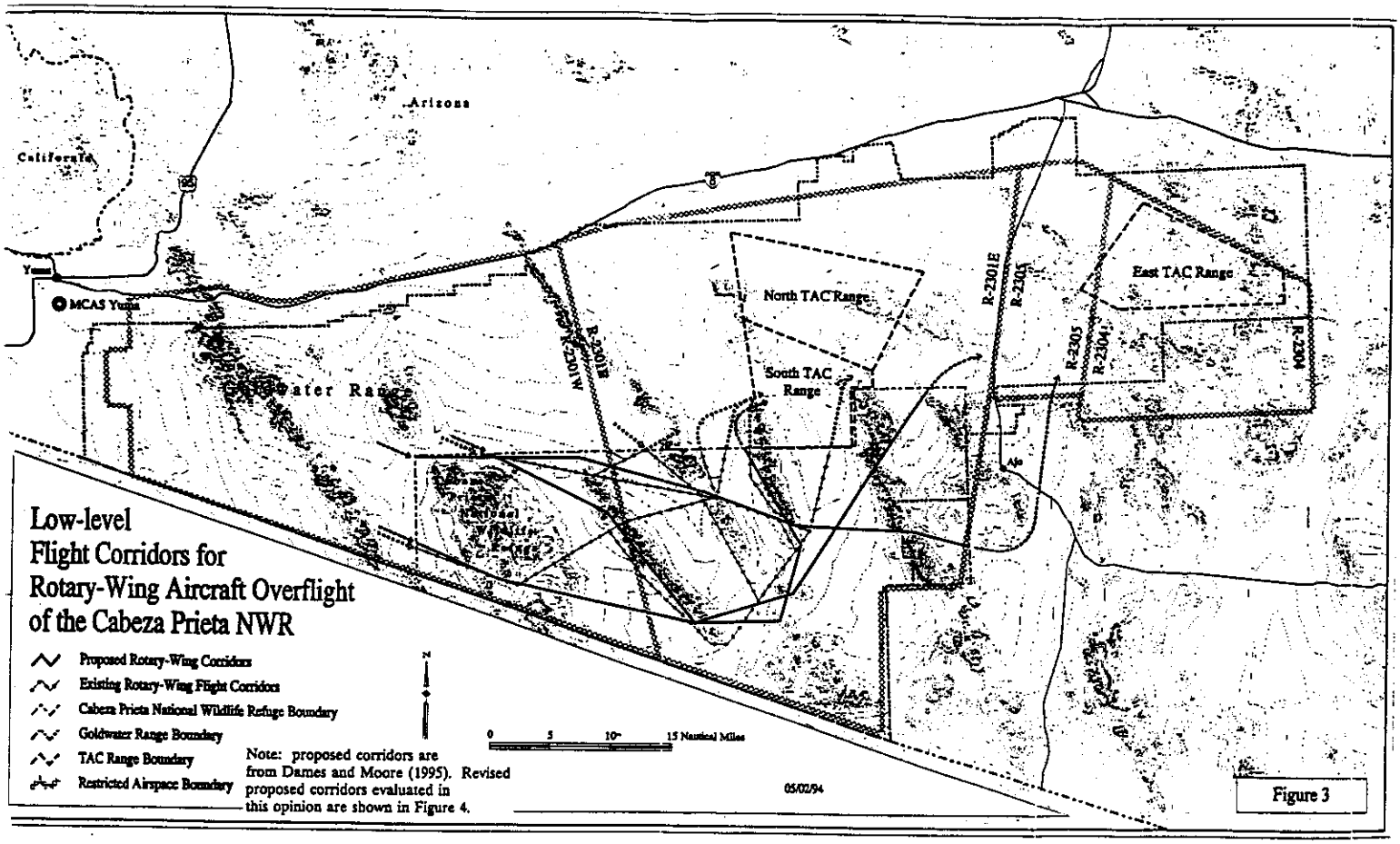


Figure 2

05/02/94


Arizona
California
Yuma
MCAS Yuma
Goldwater Range
North TAC Range
South TAC Range
East TAC Range
R-2301E
R-2301W
R-2305
R-2304
R-2306
Low-level
Flight Corridors for
Rotary-Wing Aircraft Overflight
of the Cabeza Prieta NWR
Proposed Rotary-Wing Corridors
Existing Rotary-Wing Flight Corridors
Cabeza Prieta National Wildlife Refuge Boundary
Goldwater Range Boundary
TAC Range Boundary
Restricted Airspace Boundary
N
0 5 10 15 Nautical Miles
Note: proposed corridors are from Dames and Moore (1995). Revised proposed corridors evaluated in this opinion are shown in Figure 4.
05/02/94
Figure 3

typically in the Baker Peaks/East Copper Mountain area, but occasionally in other ground support areas. Training is scheduled irregularly and generally lasts one to three weeks.

13. LAAD Team Training

The primary emphasis of this training is to provide the Low Altitude Anti-aircraft Defense (LAAD) Battalion with an opportunity to gain experience in planning and deploying 2-man stinger teams and selection of stinger tactical firing sites. As noted under the description of activities in ground-support areas, stinger teams reach tactical sites via existing roads and then move on foot to appropriate locations.

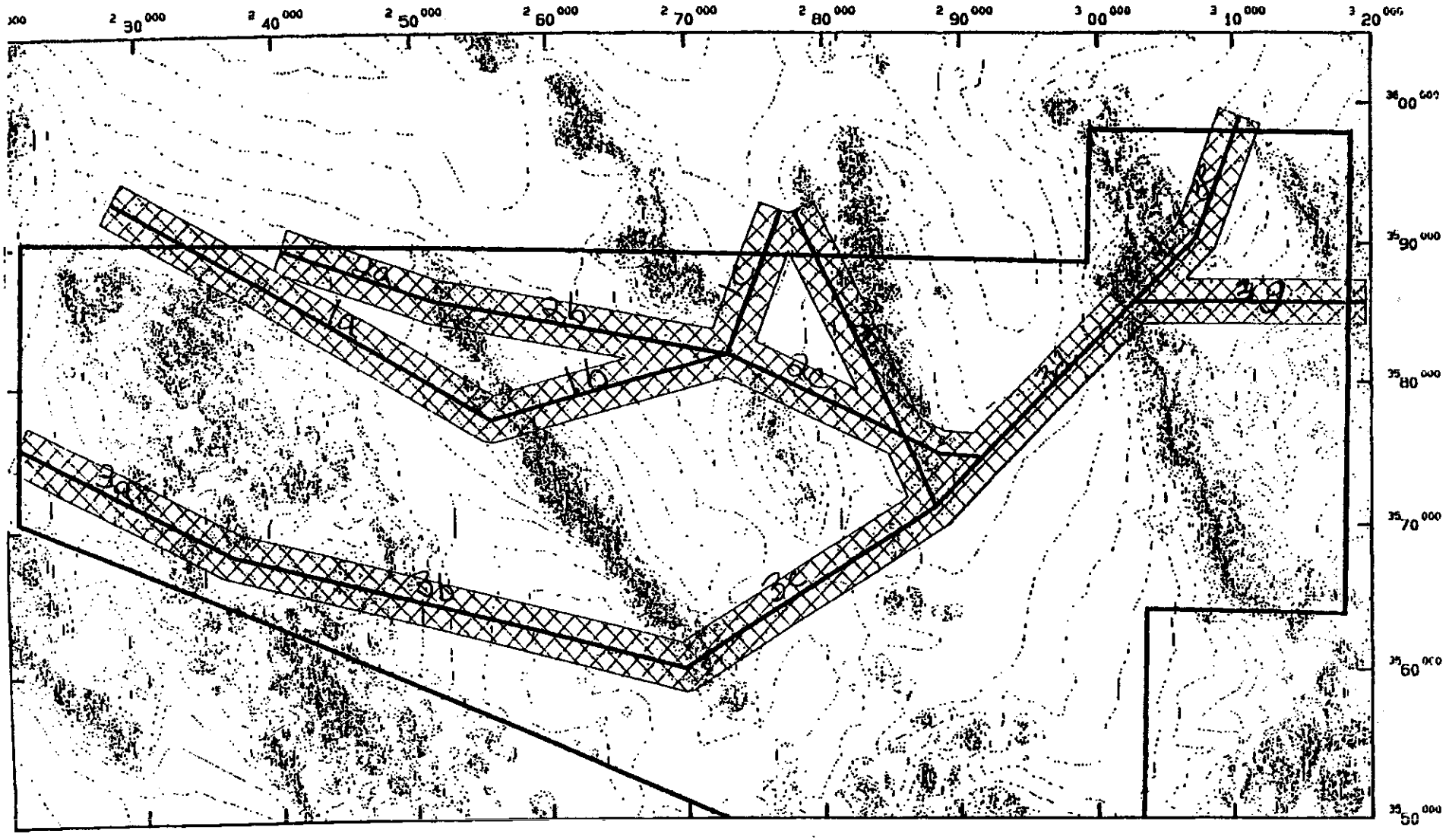
Changes to facilities and training activities have been proposed as eight separate alternatives or project features (Dames and Moore 1995, MCAS - Yuma 1995). Each alternative is considered an independent action. In the Record of Decision for the YTRC EIS, all, none, or selected alternatives could be chosen for implementation. The purpose of the proposals is to optimize training diversity and flexibility by optimizing the benefits that can be achieved from the land and airspace resources of the Goldwater Range (MCAS - Yuma 1995). Proposed alternatives include the following:

Alternative 1-2: Consolidate the 11 existing corridor segments for low-level (50-1,500 feet AGL) helicopter overflights over the Cabeza Prieta NWR into three primary corridors.

MCAS - Yuma in their biological assessment and dEIS proposed three new low-level helicopter flight corridors to replace the 11 existing corridors. Although the number of corridors would have decreased, the total length of flight corridors would have increased from 146 to 164 nautical miles. Due to concern over possible adverse effects to the Sonoran pronghorn expressed by the Sonoran Pronghorn Core Working Group at their February 22, 1996, meeting and by the Service in subsequent discussions in regards to the lesser long-nosed bat, MCAS - Yuma revised their proposal. MCAS - Yuma sent the revised proposal to our office on April 17, 1996 via facsimile mail; this revised proposal is illustrated in Figure 4. For comparison, the existing corridors and revised corridors as proposed in Dames and Moore (1995) and MCAS - Yuma (1995) are shown in Figure 3. In the current revision (Figure 4), three primary routes would replace the existing 11 corridor segments, and total miles of routes would decrease from 146 to approximately 137 nautical miles. As with the existing corridor segments, the new routes would have a corridor width of two nautical miles and a traffic flow of west to east. No increase in number of days or number of hours of helicopter flight time are proposed, and use would only occur during WTI courses.

Figure 4: Proposed low-level helicopter flight corridors over the Cabeza Prieta NWR

Note: minimum flight elevation is 50 above ground level (AGL), with the exception of route 3f, for which minimum elevation is 500 feet AGL.



Alternative 1-3: Discontinue authorization for and use of low-level holding areas for fixed-wing aircraft over the Cabeza Prieta NWR.

Two low-level holding areas currently exist over Cabeza Prieta NWR where fixed-wing aircraft can remain on-site at low levels while waiting for the best moment to advance to Air Force-managed lands of the Goldwater Range where attacks on simulated enemy ground targets can be made (Figure 3). These holding areas would be deauthorized.

Alternative 1-4: Allow the corridors for low-level overflights of the Cabeza Prieta NWR by fixed-wing aircraft to be activated for use on up to 60 days per year, but not for more than seven consecutive days at a time.

The two fixed-wing flight corridors over the Cabeza Prieta NWR (Figure 3) would be authorized for use on up to 60 days per year, including the spring and fall WTI courses and at other times of the year, as well. Current use of the existing corridors during WTI courses amounts to approximately 12 days of use (six days per WTI course) per year. Annual proposed use of the low-level, fixed-wing corridors would increase from the current seven to 14 hours to a proposed seven to 70 hours (MCAS - Yuma 1995).

Alternative 5-2: Add new target scenarios to the Moving Sands and Cactus West target ranges.

Construction of realistic simulated target scenarios is proposed for the Cactus West and Moving Sands target complexes. All construction would be contained within the current target radius of 1,500 feet from the center (Figure 1). The target run-in line to Cactus West would no longer be graded; however, signs would be maintained to guide pilots to the targets.

Alternative 6-2: Construct a narrow-width runway/roadway at AUX-2 airfield for AV-8B roadway operations.

Construction of a new hard-surfaced roadway at the AUX-2 site is proposed to support future AV-8B (harrier jet) training in narrow-width roadway operations (Figure 1). The landing area would be sited adjacent to, and on the eastern side of, the present tactical landing zone. The roadway would be 4,200 feet long by 96 feet wide, and contain vertical take-off and landing (VTOL) pads at each end. The VTOL pads would also be hard-surfaced and measure 96 feet by 174 feet. Surrounding the VTOL pads would be hard-surfaced blast stabilization areas. The area covered by the VTOL pads and the blast stabilization areas would measure 400 by 400 feet. The VTOL pads would be used for AV-8B vertical take-off, landing, and hover practice.

Alternative 7-2: Relocate the parachute drop zone for cargo recovery to a position east of AUX-2.

The existing parachute drop zone would be closed because of the lack of roads in the area, the sandy substrate that makes cargo recovery difficult, and its proximity to the explosive ordnance disposal operating area. The parachute drop zone would be relocated to the Rakish Litter area. The Rakish Litter area consists of three retired, raked air-to-ground rocket, bomb, and strafe targets located in T10S, R22W, sections 22 and 26 (Figure 1). The parachute drop zone would likely be relocated to the northernmost target site in section 26.

Alternative 8-2: Establish three ground support zones to consolidate existing ground support areas in selected intensive use locations, designate five new individual ground support areas in unserved locations, and close four ground support areas that are no longer needed.

Adjacent, associated ground support areas would be consolidated into three large ground support zones (Figure 1). These three zones would encompass 23.5 mi^2. Approximately nine mi^2 of additional existing ground support areas would remain outside these three larger areas. Four new ground support areas are proposed west of the Gila Mountains. A fifth new area is proposed near the Stoval airfield. These five areas would encompass approximately two mi^2. Four ground support areas near zone 1, comprising 1.6 mi^2, would be closed to future military use. Total areal coverage of ground support areas would increase from the existing 19.6 mi^2 to approximately 34 mi^2.

Alternative 9-2: Install 17 new threat emitters as components of the TACTS range.

Installation of new TACTS threat emitters is proposed to enhance the capability of the system to challenge aircrews with realistic electronic warfare scenarios (Figure 1). The new emitters would be placed adjacent to existing roads that would be used for installation and maintenance (Figure 1). Operation of seven of the sites would require construction of a new transmission line that would begin near Baker Peaks and run adjacent to an existing road (Figure 1). Four other threat emitters would be powered by gas generators. Each emitter would measure approximately eight by eight feet at the base and stand 10 to 14 feet high. The threat emitters would be secured to an approximately 10 by 10 foot concrete pad enclosed within a chain-link fenced enclosure. Each enclosure would be up to 50 by 50 feet. Emitters powered by generators would also require a second concrete pad within the enclosure for securing the generator.

The existing and proposed actions are programmatic in nature, in that they are comprehensive of the Yuma Training Range Complex, and most are or will be continuing actions. The temporal scope of the action under consultation and the applicability of this

opinion is until the action changes, new information becomes available indicating the effects of the action have changed, or other reinitiation criteria, described in the Closing Statement of this opinion, are triggered. Ongoing and planned activities in support of the YTRC by the Marine Corps on the Goldwater Range that could affect the Sonoran pronghorn or flat-tailed horned lizard are included in the proposed action as described herein. Detailed descriptions of the proposed action can be found in Dames and Moore (1995) and MCAS - Yuma (1995).

Proposed Mitigation Measures

MCAS - Yuma proposes a number of mitigation features to reduce adverse effects of the proposed action on the environment, including impacts to listed and proposed species (Dames and Moore 1995, MCAS -Yuma 1995). Mitigation includes specific actions to reduce adverse effects to the flat-tailed horned lizard, the Sonoran pronghorn, and the habitat of these species. Measures #21 and 22 were developed at and agreed to by MCAS - Yuma at the February 22, 1996, meeting of the Sonoran Pronghorn Working Core Group. The following mitigation features are included as a part of the proposed action:

1. MCAS - Yuma will designate a management representative and point of contact within the Range Management Department with the duty to ensure compliance with mitigation measures by all users of the Goldwater Range. This representative will have the authority to halt activities that may be in violation of such measures. A single point of contact will be designated to receive and investigate reports of unauthorized use of the airspace and ground training areas on the Range. MCAS - Yuma will continue to provide a point of contact within the Range Management Department for addressing Service concerns about overflights or other issues pertaining to NWRs.

2. All military users, including aircrews and ground support personnel of the YTRC, will be briefed on federally-listed threatened and endangered species that may be encountered during training. Vehicle speed limits will be identified as well as areas to be avoided in order to reduce chance encounters and possible harm to special status species. Aircrews will be informed of the provisions of the Act concerning harassment of threatened and endangered species. As part of the overall training program, all personnel will be informed that intentional disturbance or harassment of threatened or endangered species is a violation of the Act and could result in prosecution. Regulations will be published and military personnel will be educated to ensure limits of authorized use are understood.

3. Human sewage at base camps and other locations of troop concentrations will be contained and disposed of in a manner that meets all applicable disposal standards.

4. All litter generated by ground troops or other personnel will be policed and contained daily and will be carried off the ranges to approved landfill sites. Base camps and other troop concentration areas will be supported by the placement of commercial dumpsters for litter collection.

5. When training outside of ground support areas, small tactical units will move on foot to off-road training areas, carry out all trash from these locations, and bury human waste on site.

6. Military vehicles will be restricted to existing roads with three exceptions: 1) when operating in designated ground support areas, the parachute drop zone, or target areas, 2) in case of an emergency, and 3) when there is a bona-fide management need. Emergencies include operations such as search and rescue for downed aircrews or lost civilians. Bona-fide management needs will be limited to aircraft crash cleanup; access to develop new, approved facilities; natural resource restoration and revegetation; and other natural resource work or surveys where access by road or foot is impossible or impractical (Bill Fisher, pers. comm. 1996).

7. Roads designated for military use and the locations of ground support areas are clearly marked with non-obtrusive posts and signs in the field and on maps issued to troops.

8. Vehicles and equipment from which hazardous materials may be spilled or leaked will be placed over temporary containment aprons of plastic and sandbags. A hazardous materials response plan and team in place at MCAS - Yuma will respond immediately to any spills at the air station or in the field.

9. In the event of an aircraft crash, determination of appropriate site cleanup and restoration procedures will be coordinated with the responsible agencies within 24 hours.

10. MCAS - Yuma will establish a system for monitoring military compliance with the restrictions for limiting vehicle use to designated roads and ground support areas.

11. MCAS - Yuma will establish an annual conference with representatives of agencies involved with land and resource management on the Goldwater Range and with interested members of the public. The purposes of the conference will include reviewing the previous year's training activities, disclosing the military record for compliance with environmental regulations, and receiving input from agencies and the public about YTRC operations and environmental issues.

12. In areas with highly erodible soils, actions requiring new surface disturbance will be limited in areal extent as much as possible and confined to established roadways when feasible.

13. Where new roadways and ground support areas are established, cross- or through-drainages of existing washes (e.g., dip crossings) will be provided to the extent practical so as to not alter natural drainage or create ponding conditions.

14. All construction work and operational activities will be planned and completed to minimize increases in the potential for sheet, gully, and rill erosion. All earthwork will be shaped in a manner that will permit storm runoff with a minimum of erosion. Other measures to minimize erosion may include the construction of temporary and/or permanent berms, dikes, dams, sediment basins, and slope drains.

15. Precautions will be taken to prevent the pollution of soils and drainageways from discarded materials, sediments, muddy water, or other polluting materials.

16. All discarded matter (including but not limited to human waste, trash, garbage, oil drums, fuel, ashes, equipment, concrete, and chemicals) that is generated by development and operation of ground support areas will be removed or disposed of in a manner consistent with Federal and State regulations. Ground support areas will be maintained in a sanitary condition at all times.

17. Storage areas for petroleum products and other chemicals used during construction activities or military operations will be located or protected so that spills will not contaminate soils, enter drainageways, or impact ground water. Hazardous or toxic waste generated on site will be disposed of in a manner consistent with Federal and State guidelines.

18. Ground disturbing activities within the Gran Desierto Dunes, Tinajas Altas Mountains, and Mohawk Mountains/Sand Dunes Areas of Critical Environmental Concern (ACECs) will be limited to the maximum extent possible consistent with the training mission.

19. Vehicle use in passes through mountain ranges will be limited to the minimum necessary for training. A single road will be designated for vehicle travel through mountain passes. Other roads in passes should be obscured or at least blocked or posted to ensure closure from use.

20. Abandoned Marine Corps ground support areas within one-quarter mile of the Proposed Camino del Diablo Backcountry Byway that were previously disturbed by military activities will be managed to promote revegetation by native plant communities.

21. Use of two stinger team operating areas (Figure 1) will be limited to the October-November WTI course to reduce adverse effects to Sonoran pronghorn.

22. MCAS - Yuma will cooperate with Luke Air Force Base in an evaluation of potential adverse effects to Sonoran pronghorn from ordnance delivery and unexploded ordnance at target sites on the North and South tactical ranges. The results of the evaluation will be used to develop mitigating measures.

In flat-tailed horned lizard habitat, the following measures would also be implemented:

1. Two biological monitors will be present within an area of active construction throughout the working period each day from initial clearing to construction completion. The monitors will periodically examine (at least hourly) the construction area in order to remove any flat-tailed horned lizards from the area. Deep excavations (if any) will be inspected for lizards by the biological monitors prior to backfilling. Flat-tailed horned lizards found inside excavations will be removed immediately and relocated at least 1,500 feet from the construction area into suitable habitat.

2. The area of ground disturbance from construction will be minimized by flagging the construction area prior to construction.

3. The two western-most proposed ground support areas will be located in areas of low habitat value for flat-tailed horned lizard. Appropriate sites will be determined after considering alternate sites for each area and surveying all sites for flat-tailed horned lizards.

4. Vehicle speeds will be limited to 25 miles per hour on paved roads and 15 miles per hour on unpaved roads in flat-tailed horned lizard habitat. All military Goldwater Range users will be advised to be alert for the presence of flat-tailed horned lizards on roads so as to avoid running over lizards while driving in flat-tailed horned lizard habitat.

5. MCAS - Yuma will develop and implement a Range user education program that addresses: 1) the estimated distribution of the flat-tailed horned lizard on the Goldwater Range, 2) the measures to protect flat-tailed horned lizards and their habitat, and 3) the reporting procedures for flat-tailed horned lizard observations. All military ground users of the Goldwater Range will participate in a flat-tailed horned lizard education program. This program will emphasize the existing prohibitions for travelling off of designated roads.

6. Signs, gates, or other control measures will be used at the access road to AUX-2 (County 19th) to limit use of roads in flat-tailed horned lizard habitat to authorized military personnel.

7. MCAS - Yuma will continue to support basic research on flat-tailed horned lizards.

8. MCAS - Yuma will cooperate with the Bureau of Land Management and the Service in the development of a management plan for the Yuma Desert and Sand Dunes Habitat Management Area and the Gran Desierto Dunes ACEC. The plan will establish how a viable population of flat-tailed horned lizards will be protected in both the short term and the long term. This may include an education program that details

restrictions on certain activities and closing or restricting use of roads within flat-tailed horned lizard habitat.

STATUS OF THE SPECIES

Sonoran Pronghorn

The Sonoran pronghorn is recognized as a distinct subspecies of the pronghorn, *Antilocapra americana*. It is distinguished from other subspecies by its small size, pale coloration, and distinctive cranial features (Goldman 1945). The Sonoran pronghorn was listed as an endangered species on March 11, 1967. In Arizona, the Sonoran pronghorn occurs on the Cabeza Prieta NWR, the Goldwater Range, and Organ Pipe Cactus National Monument, from Highway 85 west to the Cabeza Prieta Mountains and from approximately the Wellton-Mohawk Canal south to the Mexican border (Snow 1994, Service 1982). Recent unconfirmed sightings suggest some animals may occur on the Tohono O'odham Reservation and in the Lechuguilla Desert, west of the Cabeza Prieta Mountains, as well (Service 1994a, J. Hervert, Arizona Game and Fish Department, Yuma, Arizona, pers. comm., 1996). In Sonora, the Sonoran pronghorn is known from near Sonoyta south to the Puerto Penasco area, east to the sandy plains around Bahia de San Jorge, and west into flats surrounding the Sierra de Pinacate (Service 1994a). The current range of the Sonoran pronghorn is estimated at more than 4.9 million acres (Service 1994a). Historically, the range of the Sonoran pronghorn may have been much larger, extending further west, possibly into the Yuma Desert, Imperial Valley of California, and northeastern Baja California; to north of the Gila River; east to the Baboquivari Mountains; and south to Bahia Kino or Guaymas (Service 1994a, Hall and Kelson 1959, Hoffmeister 1986). However, precise determination of the historic range is precluded by a lack of specimens and the largely anecdotal nature of historic records.

Based on survey data collected from 1992 to 1994, an estimated 125 to 256 Sonoran pronghorn occur in Arizona and 179 to 313 occur in Sonora (Snow 1994, Service 1994a). Data are insufficient to determine trends in population size (Service 1994a). Pronghorn are typically found in broad, alluvial valleys. They inhabit creosote, *Larrea tridentata*, and bursage, *Ambrosia deltiodea, A. dumosa*, vegetation communities year round and more diverse vegetation associations from late winter to early fall (Service 1994a). Hughes and Smith (1990) found Sonoran pronghorn in areas of approximately 11 percent perennial cover.

The diet of Sonoran pronghorn consists of a variety of plant materials, particularly cacti, such as fruits of jumping cholla, *Opuntia fulgida*, herbaceous species such as plantain, *Plantago insularis*, and filaree, *Erodium texanum*, a variety of shrubs and trees, and grasses (Hughes and Smith 1990, Monson 1968, Carr 1970). The importance of the availability of water sources to Sonoran pronghorn is unknown. Hughes and Smith (1990) found no significant difference in distance of pronghorn localities to water between the wet and dry seasons, implying that they do not congregate near water. Monson (1968) found no evidence that pronghorn drink water, even when it is available. Wright and deVos (1986) and J.

Hervert (pers. comm. 1996) have documented Sonoran pronghorn at water sources on numerous occasions, but they only documented one instance of a Sonoran pronghorn drinking water.

Pronghorn become sexually mature at 12 to 16 months. Parturition occurs from February through May and animals rut from July to September (Kitchen and O'Gara 1982, Service 1994a). Mean home range size is 56.1 km^2 for males and 45.2 km^2 for females (deVos 1990). At the onset of the hot, dry period in late spring, individual animals move distances of up to 50 km from lower, sparsely vegetated valleys to areas of more complex vegetation. With the onset of the summer rains, animals move back to areas with low vegetation diversity (deVos 1990).

The cause of population declines and extirpation from portions of its historic range include unregulated hunting in historic times, current illegal hunting in Sonora (Service 1994a), degradation of habitat by livestock grazing, disturbance of habitat resulting from military ground-based activities, disturbance of animals caused by military overflights, loss of riparian habitat on the Gila River and the Rio Sonoyta that may have been important as foraging or watering areas, and conversion of habitat to agriculture, particularly in the Gila River Valley and Imperial Valley, California (deVos 1990, Service 1994a, 1982). Pronghorn that frequent artificial or natural water sources may be subject to increased predation levels due to the concentration of predators near water (Service 1994a). The Service believes the Sonoran pronghorn is a critically-endangered species. Total number of pronghorn is less than 600 and this subspecies lives in an extremely harsh desert environment that is subject to extended drought. As a result, the viability of the species is sensitive to environmental and demographic stochastic events.

A population viability analysis conducted with the program VORTEX, suggested that three factors are especially important in determining population persistence. The variability in population size increased, and in some cases, populations went extinct if any of the following three variables were included in a simulation: five catastrophic events, such as drought, occurring in 100 years; annual mortality of females in excess of 60 percent; or female fawn mortality in excess of 60 percent (deVos 1995).

The Service finalized a recovery plan for the Sonoran pronghorn in 1982. The recovery objective was defined as "maintain existing population numbers and distribution of Sonoran pronghorn while developing techniques which will result in a U.S. population of 300 animals (average for a five-year period) or numbers determined feasible for the habitat." The recovery plan is currently being revised. The draft plan calls for downlisting the Sonoran pronghorn to threatened when the number of animals in Arizona reaches at least 500 and remains stable for a five year period, or when numbers are determined adequate to sustain the population through time (Service 1994a).

Additional information on the taxonomy, range, distribution, biology, and threats to the Sonoran pronghorn can be found in Service (1994a, 1982), Wright and deVos (1986),

Hoffmeister (1986), Mearns (1907), Hughes (1991), Edwards and Ohmart (1981), deVos (1990), and Cockrum (1981).

Flat-tailed Horned Lizard

The flat-tailed horned lizard is a small, cryptically colored, iguanid lizard restricted to flats and valleys in the western Sonoran Desert, including the Coachella, Borrego, and Imperial valleys in California; the Yuma Desert in extreme southwestern Yuma County, Arizona; and adjacent portions of Baja California Norte and Sonora, Mexico (Johnson and Spicer 1985). On November 29, 1993, the Service published a rule in the Federal Register proposing the flat-tailed horned lizard as a threatened species (Service 1993).

In Arizona, the range of this species is approximately bounded by the Gila River on the north, urban and agricultural development along the Colorado River on the west, and to the east by bajadas and relatively coarse, alluvial soils on the west side of the Gila and Butler Mountains (Rorabaugh et al. 1987). In this area, most records for the species are from areas of fine, often windblown, silica sand dominated by sparse stands of white bursage *Ambrosia dumosa*; creosote *Larrea tridentata*; and galleta grass *Hilaria rigida* (Rorabaugh et al. 1987, Hodges 1995). The species shows a preference for and may be more abundant on sandy substrates as compared to desert pavement or hardpan surfaces (Muth and Fisher 1992, Rorabaugh et al. 1987), and in Arizona is most often found in areas of silica sand, rather than granitic sands and gravels (Hodges 1995).

The diet of the flat-tailed horned lizard consists primarily of ants, particularly from May to July (Parker and Pianka 1975; Turner and Medica 1982; Mark Fisher, Deep Canyon Desert Research Center, Palm Desert, California, pers. comm. 1992). The species is active primarily from mid-February to mid-November (Muth and Fisher 1992, Mayhew 1965), although some evidence exists of a late summer and fall period of dormancy in adults (Howard 1974) and juveniles may be active throughout the winter on warm days (Muth and Fisher 1992). Mean home range of telemetered flat-tailed horned lizards in Imperial County, California was 4.7 acres (Muth and Fisher 1992). Females produce one or two clutches of eggs that hatch in July and August-September (Turner and Medica 1982, Muth and Fisher 1992, Howard 1974). Flat-tailed horned lizards construct burrows in which they hibernate in winter and escape high temperatures in summer (Muth and Fisher 1992, Rorabaugh 1994). Mean cloacal temperature of active flat-tailed horned lizards in California was 37.7° C (Mayhew 1965). Maximum and minimum voluntary body temperatures are 41.0° and 29.3° C, respectively (Brattstrom 1965). Individuals become stressed when cloacal temperatures reach 45° C or more (Mayhew 1965).

The Service proposed the flat-tailed horned lizard as a threatened species because of documented and anticipated population declines and loss of habitat associated with widespread habitat loss, fragmentation, and degradation due to human activities such as agricultural and urban development, off-highway vehicle use, energy developments, construction of roads and canals, and military activities. In addition, insecticide applications

in flat-tailed horned lizard habitat to control an agricultural pest may have reduced ant populations, the primary prey of the flat-tailed horned lizard (Service 1993, Bolster and Nicol 1989). In the Yuma Desert west and north of the Goldwater Range, numerous proposed or ongoing activities threaten the habitat of the flat-tailed horned lizard. Recent Federal actions include development of a desalinization sludge disposal facility and rights-of-way for roads and utilities. Other non-Federal activities are described in the "CUMULATIVE EFFECTS" section.

The Service is currently working with a number of State, Federal, and local agencies, including the MCAS - Yuma and the Southwest Division, to develop a Rangewide Management Plan and conservation agreement for the flat-tailed horned lizard. The participating agencies will likely agree to manage several areas for viable populations of flat-tailed horned lizards, including a portion of the Yuma Desert. Although the management area boundaries have yet to be finalized, a portion of the Yuma Desert west of the Gila and Butler Mountains on the Goldwater Range will probably be included in the Yuma Desert flat-tailed horned lizard management area. If implementation of the conservation strategy removes a significant number of the threats to the species, listing of the flat-tailed horned lizard as a threatened species may not be necessary.

Further information on the range, biology, and ecology of the flat-tailed horned lizard can be found in Muth and Fisher (1992), Turner et al. (1980), Turner and Medica (1982), Rorabaugh et al. (1987), Rorabaugh (1994), Norris (1949), Hodges (1995), and Mayhew (1965).

ENVIRONMENTAL BASELINE

Project Location and General Vegetation Communities:

Existing and proposed actions of the YTRC that may affect the Sonoran pronghorn and flat-tailed horned lizard would occur in southeastern Yuma County and southwestern Maricopa County in an area of the Goldwater Range bounded approximately by Interstate 8 on the north, the Yuma area on the west, the international boundary on the south, and the Aguila and Growler Mountains on the east. Most proposed activities would be limited to the area west of the Mohawk Mountains in airspace R-2301W, but limited overflights would occur to the east in airspace R-2301E of the Goldwater Range, including portions of Cabeza Prieta NWR.

The vegetation community of the western portion of the Goldwater Range has been classified as the lower Colorado River Valley subdivision of Sonoran desertscrub (Turner and Brown 1982). It is the largest and most arid subdivision of Sonoran desertscrub. Approximately 2.7 inches of precipitation fall annually at Yuma, with slightly more than half of this occurring in the winter months (Turner and Brown 1982). Annual precipitation increases from west to east across the Goldwater Range.

Vegetation in the valleys, particularly in the Yuma Desert, is dominated by the creosote, *Larrea tridentata*, - white bursage, *Ambrosia dumosa*, series of Sonoran desert scrub (Turner and Brown 1982). This series occupies approximately three-fourths of the lowland or valley areas in the Goldwater Range (Reichenbacher and Duncan 1989). In this series creosote and white bursage are often co-dominants, with galleta grass, *Hilaria rigida*; dalea, *Psorathamnus emoryi*; coldenia, *Tequilia plicata*; and other species locally abundant. Distinctive floras are also found in dunes in the area, particularly in the Yuma Desert west of the Tinajas Altas Mountains, at Pinta Sands, and at the Mohawk Dunes. Species such as mormon tea, *Ephedra trifurca*; dicoria, *Dicoria canescens*; and wire lettuce, *Stephanomeria schotti*; are found in these dune habitats.

In drainages, bajadas, and montane habitats, the mixed scrub series (Turner and Brown 1982) is found. This community is more diverse than the creosote-bursage series and includes species more representative of the Arizona Upland subdivision of Sonoran desertscrub, such as palo verde, *Cercidium floridum* and *C. microphyllum*; saguaro, *Carnegia gigantea*; ironwood, *Olneya tesota*; and desert lavender, *Hyptis emoryi*; among others. Species such as elephant tree, *Bursera microphylla*; limber bush, *Jatropha cuneata*; and Mexican jumping bean, *Sapium biloculare*; are also found in this community, but are more representative of the Central Gulf Coast subdivision of Sonoran desert scrub found to the south in Sonora (Dames and Moore 1995, Turner and Brown 1982). Vegetation on Cabeza Prieta NWR, Organ Pipe National Monument, and most of the Goldwater Range is largely undisturbed by human activities.

Status of the Listed/Proposed Species in the Project Area:

<u>Sonoran Pronghorn</u>

Figure 5 illustrates all Sonoran pronghorn localities in Arizona registered during collaring and telemetry work from 1983 to 1990 and 1994 to 1995, and comprehensive aerial surveys conducted in late February and early March, 1994. Not shown are results of limited aerial surveys conducted in December 1992, a test of aerial survey techniques in April 1992, and incidental sightings. The 1994-1995 collaring and telemetry localities and the 1983-1990 telemetry localities were collected by locating telemetered animals. These localities show areas frequented by these animals, but may not be representative of areas that are used heavily or that are especially important for pronghorn, in general. The 1994 aerial survey was systematic and may be indicative of important use areas during the time of the survey. However, pronghorn move seasonally (deVos 1990) and probably annually, and number of localities recorded during the 1994 survey was relatively small (42). Thus, these data also may not reflect areas that are most important or most used by pronghorn in the long-term. Although limited in scope, during surveys in December 1992, groups of animals were located in 13 areas, with the greatest number of animals found in the Growler and San Cristobal valleys (Snow 1994).

Regional Sonoran Pronghorn Locations

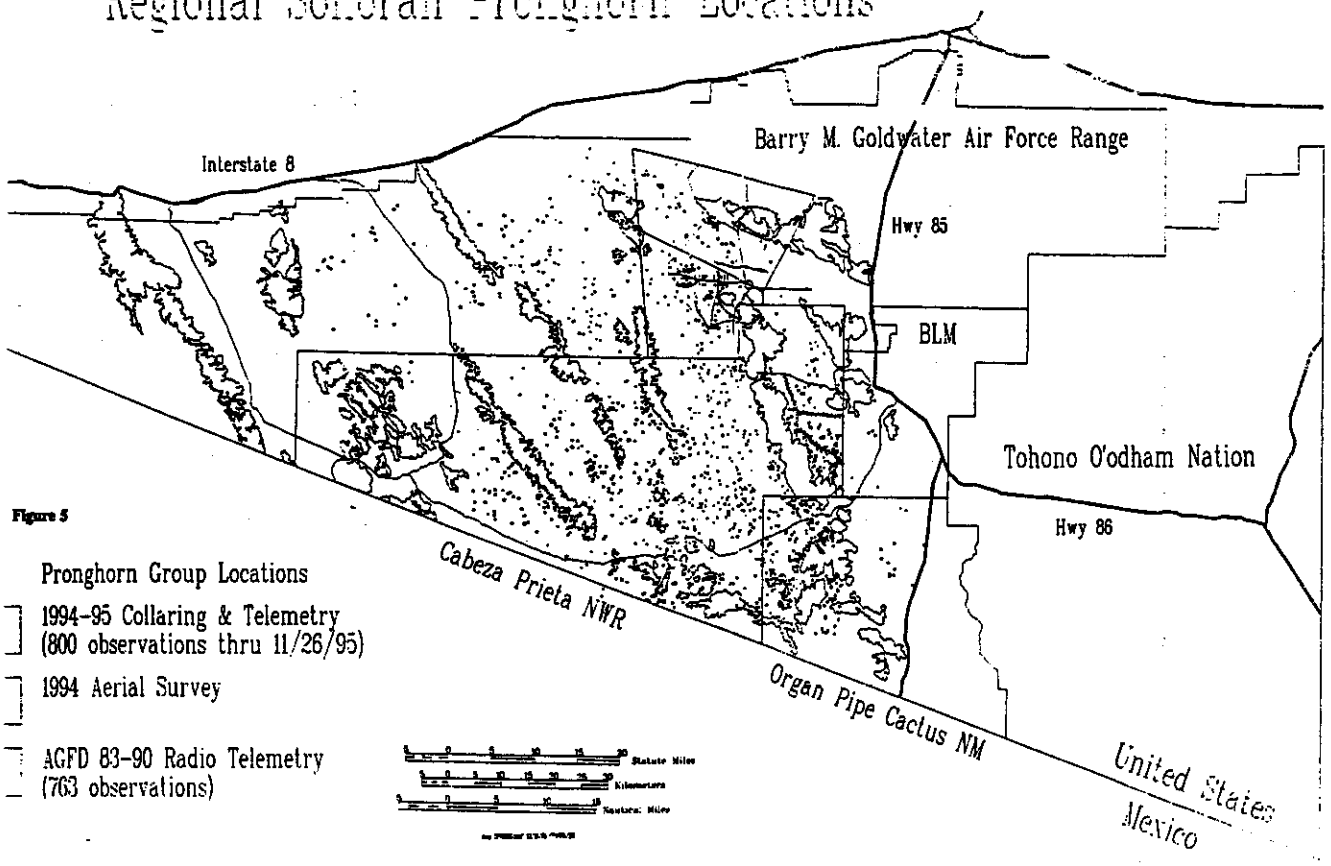


Figure 5

The greatest value of Figure 5 is to illustrate the current range of the Sonoran pronghorn. Although no single survey or method is adequate to illustrate important use areas, taken together, as in Figure 5, they give some indication of where pronghorn are most likely to occur (J. Hervert, pers. comm. 1996). The majority of localities are in areas not administered by the MCAS - Yuma, including the eastern half of Cabeza Prieta NWR and the western half of Organ Pipe Cactus National Monument. All localities are south of Interstate 8, east of the Copper and Cabeza Prieta mountains, and west of Highway 85. Habitat north of Interstate 8 has not been surveyed to any extent for pronghorn, but habitat in this area is highly fragmented. Interstate 8 and the Wellton-Mohawk Canal are probably formidable barriers to movement of pronghorn.

On Cabeza Prieta NWR pronghorn groups were most often observed on the southwestern edge of the Sierra Pinta Mountains and in the Pinta Sands, in the valley between the Sierra Pinta and Bryan Mountains, in the San Cristobal and Growler valleys, and near Daniel's Arroyo. At Organ Pipe Cactus National Monument, pronghorn were most often observed near Acuna and Bates wells, and west of the Bates Mountains and Cipriano Hills. On the Goldwater Range, concentrations of animals were observed near "HE Hill" (Figure 5), with scattered sightings through the San Cristobal Valley and into the Mohawk Valley. J. Hervert (pers. comm. 1996) also believes that pronghorn frequent the northern portion of the Agua Dulce Mountains, although data presented in Figure 5 do not reflect this. Pronghorn may have used the Pinta Sands area to a greater degree in the early 1970's (Carr 1970).

Pronghorn often seek the thermal cover found in the Arizona Upland subdivision of Sonoran desert scrub during the hot, dry summer months. This cover is best developed in the southeastern portion of their range in Arizona. With the onset of summer rains or cooler temperatures, pronghorn may move to the more open valleys and flats, such as the Growler Valley and Pinta Sands. Rocky, mountainous terrain, such as the slopes of the Growler or Mohawk Mountains, is not considered habitat for the Sonoran pronghorn (deVos 1990); however, they may be found on lower slopes and in associated washes (Laura Thompson-Olais, Cabeza Prieta NWR, pers. comm., 1996)

Threats to the Sonoran Pronghorn and Their Habitat Specific to the Project Area

A general listing of threats to the Sonoran Pronghorn that are contributing to its current endangered status are listed in the section "Status of the Species," above. This general listing applies for the most part to the project area, but the limited access and military uses of the Goldwater Range, and management and purposes of the Cabeza Prieta NWR create a unique management scenario with both beneficial and detrimental aspects in regards to management and recovery of the pronghorn.

Because of a military withdrawal, management of ACECs, and other land management policies on the Goldwater Range; and wilderness designations and land use policies on the Cabeza Prieta NWR, many uses that could be detrimental to Sonoran pronghorn, such as mining, mineral leasing, geothermal development, land disposal, leasing for agriculture, and

livestock grazing are all excluded from the project area (University of Arizona 1986, MCAS - Yuma 1995). Wilderness and land use restrictions in adjacent Organ Pipe Cactus National Monument also preclude most land uses that might adversely affect Sonoran pronghorn. These designations and use limitations have acted to secure a large portion of the remaining habitat of the Sonoran pronghorn and protect it from a variety of adverse effects. At the same time, permitted uses, such as military uses, and to a lesser degree, recreational activities, have resulted in habitat destruction and degradation and disturbance of Sonoran pronghorn. Ground-based military activities on the Goldwater Range, especially in ground support areas, have resulted in localized destruction of vegetation that otherwise would provide forage and cover for Sonoran pronghorn. Intensive ground-based activities probably also flush pronghorn away from localized areas during maneuvers (Dames and Moore 1995); although deVos (1989) suggested that military use zones do not affect pronghorn habitat use. Military overflights, particularly low-level flights, may startle pronghorn, cause them to flush from cover, or could affect their use of an area, although little data exist to quantify these effects on the Sonoran pronghorn (Hughes and Smith 1990, deVos 1989, Dames and Moore 1995). Because of restricted access, poaching and other illegal activities that would adversely affect pronghorn probably rarely, if ever, occur. However, increasing recreational use of Cabeza Prieta NWR, Organ Pipe Cactus National Monument, and Bureau of Land Management lands east of Cabeza Prieta NWR is resulting in increased encounters between people and pronghorn. Unauthorized off-road vehicle use appears to be increasing in the Mohawk Dunes and could potentially adversely affect habitat or pronghorn use of the area.

A variety of other activities, unrelated to the YTRC, but that may affect Sonoran pronghorn, occur in this area of southwestern Arizona. Luke and Davis Monthan Air Force Bases carry out approximately 5.4 and 19 hours, respectively, of low-level fixed-wing aircraft flights in two designated corridors over the northeastern portion or the Cabeza Prieta NWR annually (MCAS - Yuma 1995). Extensive fixed-wing and helicopter flights at varying altitudes, live and inert ordnance delivery at target sites on the North and South tactical ranges, and various other air-ground combat training activities on the eastern portion of the Goldwater Range (R-2301E) are carried out by Luke and Davis Monthan AFB, Army National Guard, and other units of the Department of Defense (University of Arizona 1986, MCAS - Yuma 1995). The U.S. Border Patrol conducts approximately 300 hours of low-level helicopter flights over the Cabeza Prieta NWR annually. Bighorn sheep and Sonoran pronghorn surveys using small, fixed-wing aircraft, are carried out by the Service and Arizona Game and Fish Department. The bighorn surveys require approximately 85 hours of flight time over the Refuge every three years. Sonoran pronghorn work required approximately 85 hours of fixed-wing and 45 hours of helicopter flight time in 1994. Approximately one-third of the flight time for Sonoran pronghorn work occurred over the Refuge (MCAS - Yuma 1995).

The Border Patrol also conducts surveillances by vehicles on the Refuge and on the Goldwater Range. The Border Patrol maintains a drag road to facilitate detection of illegal aliens on the northern boundary of Cabeza Prieta NWR. Recreational activities, particularly camping, hunting, and travelling on roads occurs throughout the area, including Organ Pipe Cactus National Monument and adjacent private and public lands. However, recreational

activities are limited due to limited access, vehicular restrictions, wilderness designation, and other management considerations. Livestock grazing occurs on lands east of the Goldwater Range and north of Organ Pipe Cactus National Monument.

Flat-tailed Horned Lizard

The estimated distribution of the flat-tailed horned lizard on the Goldwater Range is presented in Figure 6. This distribution map was prepared by members of the Flat-tailed Horned Lizard Working Group and Flat-tailed Horned Lizard Conservation Team in support of the draft Rangewide Management Strategy, currently in preparation. It is based on locality records and the distribution of apparently suitable habitat. This estimated distribution is similar to that presented in Figure 4 of Dames and Moore (1995). A record from Sonora Highway 2, approximately 60 miles west of Sonoyta, Sonora (Johnson and Spicer 1985), suggests that the species may occur on sandy substrates at or near Pinta Sands on Cabeza Prieta NWR, well east of the range shown in Figure 6. However, as yet the species is undocumented from this area.

Relative abundance of flat-tailed horned lizards has been estimated by standardized transects in which observers count flat-tailed horned lizards and their scat. Numbers of scat and lizards observed per hour has been used as an index to the species' relative abundance as follows (Bureau of Land Management 1990):

High relative abundance. = >9 scat/hour (hr) or at least 1 *P. mcallii* observed

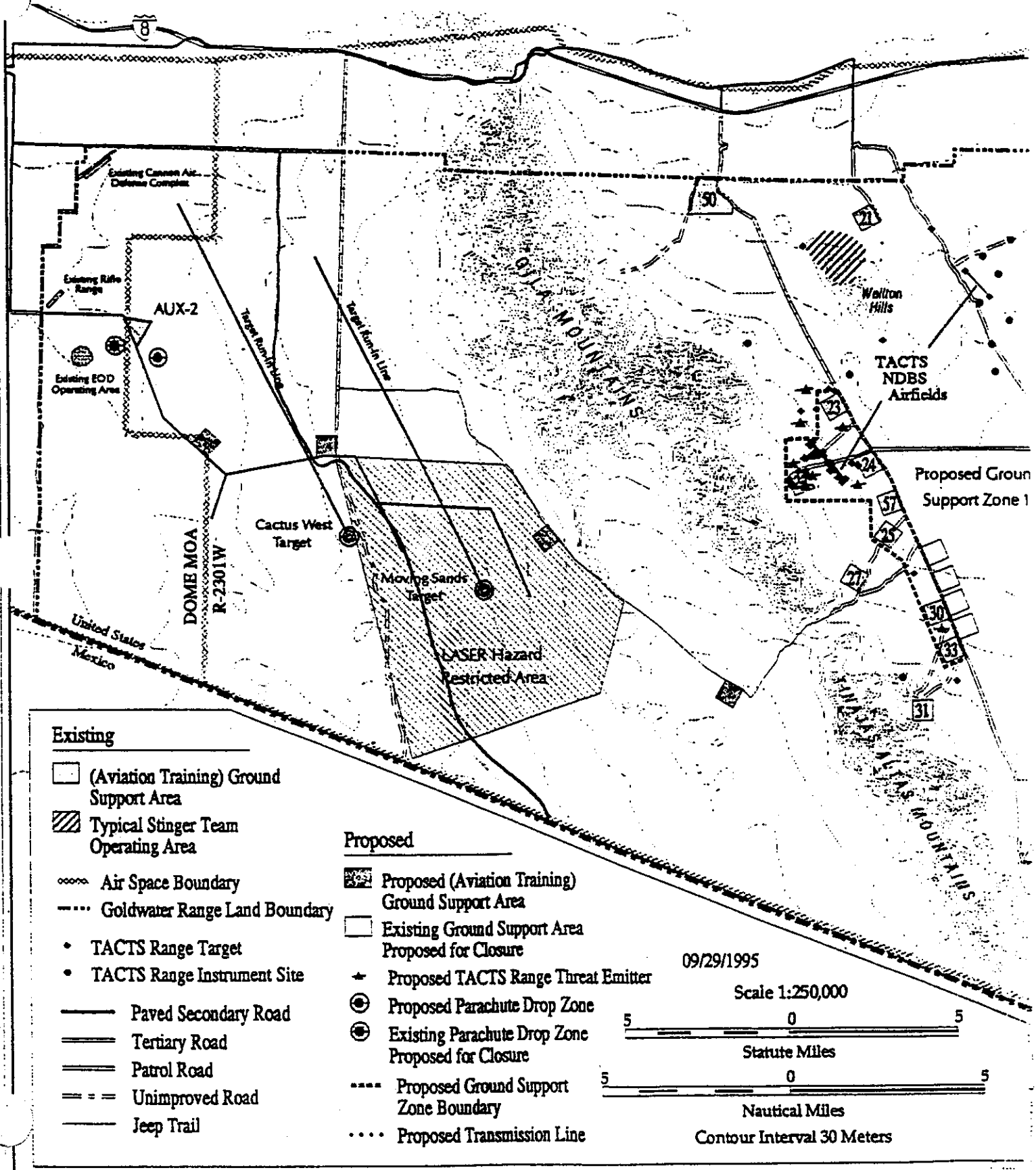
Medium relative abundance = 5 to <9 scat/hr

Low relative abundance = 1 to <5 scat/hr

Poor relative abundance or unoccupied habitat = <1 scat/hr

The Flat-tailed Horned Lizard Interagency Technical Advisory Team (ITAC), comprised of biologists and land managers from a variety of State and Federal agencies, met in April, 1993, to discuss current research and the validity of this survey method. The ITAC concluded that scat counts may not provide a reliable index to the relative abundance of the flat-tailed horned lizard and should be used with great caution. The primary concern was that the assumption of a correlation between scat counts and lizard density has never been tested. Scat count data are best used in combination with lizard observations and habitat characteristics to determine the importance of an area for this species (Rorabaugh 1994). The Flat-tailed Horned Lizard Conservation Team, a group of biologists assisting in the preparation of the Rangewide Management Strategy is developing a survey protocol for the species. However, as of this writing, the protocol was still in draft form and not available.

Figure 6: Estimated distribution of the flat-tailed horned lizard on the Goldwater Range. (Note: the range of the species also extends to the west and north of the Goldwater Range).



Scat and lizard surveys have been conducted at the Goldwater Range by a number of investigators. Dames and Moore (1995) conducted scat and lizard surveys at seven sections (each section is one mi^2) in the vicinity of Moving Sands and Cactus West targets, and near AUX-2. Hodges (1995) intensively surveyed 19 four-hectare plots for scat and lizards throughout the Goldwater Range west of the Gila and Tinajas Altas mountains. Rorabaugh et al. (1987) surveyed 27 sections for scat and lizards. Scat counts and flat-tailed horned lizard observations have also been made by a number of other investigators on the Goldwater Range (Edwards 1979; Johnson and Spicer 1985; Bryan Morrill, MCAS - Yuma, pers. comm. 1995; Christine Bates, MCAS - Yuma, pers. comm. 1994; Russell Duncan, Southwestern Field Biologists, Tucson, AZ, pers. comm. 1995). The results of these studies and observations support delineation of the range of the flat-tailed horned lizard as shown in Figure 6.

Rorabaugh et al. (1987) recorded high scat counts, possibly indicating high flat-tailed horned lizard abundance, primarily from lands to the west of the Goldwater Range in township 11S, R23W; just inside the western edge of the Goldwater Range in T11S, R22W; and just east of the Yuma Dunes to the international boundary. Very high scat counts were registered in the latter area; however, both flat-tailed horned lizards and desert horned lizards, *Phrynosoma platyrhinos*, were observed there. Scat of the two species is indistinguishable. The authors believed flat-tailed horned lizard densities were probably relatively high in this area because approximately half of all horned lizard observations were of the flat-tailed horned lizard. Hodges (1995) registered relatively high scat counts and observed many flat-tailed horned lizards on plots in the southwestern corner of the Goldwater Range, generally west of the Yuma Dunes. Plots east of the dunes supported desert horned lizards, or in one case, both desert and flat-tailed horned lizards. Both species were found on the northern boundary of the Range, although only desert horned lizards have been found east of Fortuna Road (Hodges 1995; Rorabaugh et al. 1987; Service files, Phoenix). Bryan Morrill has observed more than one hundred flat-tailed horned lizards on the paved access road to AUX-2 and the Moving Sands Target. Flat-tailed horned lizards have been found along nearly every half-mile segment of the access road from the Goldwater Range boundary to approximately 1.5 to 2.0 miles west of the tracker building at the junction with the southern extension of Foothills Boulevard. Up to 40 flat-tailed horned lizards have been found during surveys of this road (Dames and Moore 1995), possibly indicating a high relative abundance of flat-tailed horned lizards.

One hundred and eight one-mile transects were walked in seven sections by Dames and Moore staff in the vicinity of AUX-2 and the Moving Sands and Cactus West targets (Dames and Moore 1995). Transects were conducted from 16 to 19 May, 1992. No flat-tailed horned lizards were observed during these transects; however, four desert horned lizards were observed at the Moving Sands target. A total of 271 scat were observed. Scat per hour ranged from 14.2 at a section near AUX-2, to 2.7 near the Cactus West target. Of the three areas surveyed, the sections near AUX-2 appeared to be of highest quality for the flat-tailed horned lizard, based on scat counts and general habitat conditions. Although 21 of 48 scat counts in sections at and near Moving Sands were moderate or high counts, only desert

horned lizards were observed there, indicating the scat probably was not produced by the flat-tailed horned lizard (Dames and Moore 1995). Dames and Moore (1995) considered habitat at and near the Cactus West target to be marginal for both species of horned lizard.

Both of the target sites are at or near the edge of the range of the flat-tailed horned lizard. Only desert horned lizards have been observed at the Moving Sands target. The nearest record for flat-tailed horned lizard is approximately two miles to the southwest in T11S, R20W, section 6 (Rorabaugh et al. 1987). Although the eastern limit of the species' range is unclear, flat-tailed horned lizards probably do not occur at the Moving Sands target site (Figure 6). Desert horned lizards have been observed in T11S, R21W sections 23 and 15, immediately east and north, respectively of the section in which the Cactus West target is located (Rorabaugh et al. 1987). However, a flat-tailed horned lizard was also observed in T11S, R21W, section 15 (Edwards 1979), suggesting flat-tailed horned lizards may occur at the Cactus West target.

The western-most proposed ground support area, located along the access road to the targets, is well within the range of the flat-tailed horned lizard and is presumed to be occupied habitat (Figure 6). Despite road surveys by Bryan Morrill and others (R. Duncan, Southwestern Field Biologists, Tucson, AZ, pers. comm., 1986), flat-tailed horned lizards have not been located as far east as the proposed ground support area located immediately west of Fortuna Road (Figure 1). Rorabaugh et al. (1987) surveyed the proposed site and counted seven scat per hour; however, no horned lizards were observed, and scat counted may have been produced by desert horned lizards. The nearest flat-tailed horned lizard locality of which the Service is aware is approximately one mile west-southwest of the proposed ground support area.

The existing and proposed parachute drop zones, the EOD Operating Area, rifle range, and the Cannon Air Defense Complex are all within the known range of the flat-tailed horned lizard (Figure 6). The species is presumed to occur at all of these sites.

The proposed ground support areas located along the Camino del Diablo, east of the Moving Sands target, and all proposed and existing facilities and activities east of the Tinajas Altas and Gila mountains lie well east of flat-tailed horned lizard localities and are presumed to be outside of the range of the species.

Threats to Flat-tailed Horned Lizards and Their Habitat Specific to the Project Area

A general listing of threats that have contributed to the declining status of the flat-tailed horned lizard and that ultimately triggered the proposed listing of the species as threatened is presented in the section entitled "Status of the Species." These threats are primarily human-caused factors. Because of the limited access to the Goldwater Range and the need to maintain large, open spaces for military training, flat-tailed horned lizard habitat on the Range has been protected from many of the activities that destroy or degrade habitat or directly affect lizard populations elsewhere. Adverse effects to the flat-tailed horned lizard

are limited to specific sites, such as at the rifle range, AUX-2 airfield, access roads, and other facilities within the range of the species.

Non-military activities on the Goldwater Range may currently or in the future affect flat-tailed horned lizards. The U.S. Border Patrol conducts patrols on the Range, particularly on the border road west of the Yuma Dunes, but occasionally off-road as well. Limited recreational use of the Range, including unauthorized off-road vehicular activity, occurs on the Goldwater range in flat-tailed horned lizard habitat, particularly on the northern boundary near the Foothills. Vehicular use both on and off road in flat-tailed horned lizard habitat results in mortality of flat-tailed horned lizards. Off-road travel also degrades habitat. The Yuma Metropolitan Planning Organization is developing a proposal for the Yuma Area Service Highway, which would traverse the northwestern boundary of the Goldwater Range. This highway would eliminate and fragment habitat and likely result in a mortality sink for flat-tailed horned lizards and other animals.

EFFECTS OF THE PROPOSED ACTION

Sonoran Pronghorn

The following analyses of the effects of ongoing and proposed actions on the Sonoran pronghorn are, in many cases, inconclusive due to a lack of information. For instance, the effects of military overflights on pronghorn behavior, habitat use, and physiology can only be extrapolated from other ungulate species and other subspecies of pronghorn living under very different environmental conditions. Whether or not Sonoran pronghorn avoid areas where certain military or other activities occur, or if certain activities may cause stress and related adverse physiological changes is unknown or can only be evaluated based on anecdotal observations and information developed for other ungulates. Because of small population size, the harshness of its environment, unpredictable forage production and probability of extended drought, and possibility of illegal or uncontrollable human impacts, such as poaching in Sonora, the Sonoran pronghorn is a critically endangered species. Thus, any adverse impact to this animal or its habitat is taken very seriously by the Service. In accordance with 50 CFR 402.14(g)(8), the following analyses is based on the best information available, but this information is often woefully inadequate. Additional research is necessary to quantify how proposed or ongoing military or other activities affect the Sonoran pronghorn.

Effects of ongoing and proposed activities on the Sonoran pronghorn can be segregated into two categories: 1) effects of ground-based activities, and 2) effects of overflights. Ground-based activities potentially can destroy or degrade forage and cover, and result in behavioral or physiological changes that may be detrimental (Geist 1971, Freddy et al. 1986, Workman et al. 1992). Although military overflights do not destroy or degrade habitat, pronghorn may exhibit a startle response or may flush from cover in response to overflights (Hughes and Smith 1990, Workman et al. 1992, Luz and Smith 1976). Pronghorn could also alter use of areas to avoid aircraft noise or disturbance (Bleich et al. 1990, Krausman et al. 1986), or

they may exhibit other physiological or behavioral responses that could be detrimental (Stockwell and Bateman 1987, Berger et al. 1983).

Effects of Ground-Based Activities:

Although no quantitative data exist for the Sonoran pronghorn, a large body of literature indicates that other subspecies of pronghorn, as well as other ungulates, exhibit various changes in behavior and physiology in response to ground-based human disturbance, such as moving vehicles, humans on foot, discharge of firearms, etc. Behavioral responses of wild ungulates to human activities range from none to panic flight and abandoning habitat areas, while physiological responses may include a variety of effects that can influence survival and reproduction (Geist 1971). Although response of Sonoran pronghorn to ground-based activities has not been rigorously investigated, some information exists.

DeVos (1989) investigated the relationship of telemetered Sonoran pronghorn localities to the proximity of "concentrated military activities" on the Goldwater Range. Numbers of localities were found to be greater than expected particularly in areas within 200 meters of military zones and were less than expected in areas 1,600 to 6,400 meters from military zones. The author attributed the latter to the fact that many pronghorn were initially captured on the Cabeza Prieta NWR and at Organ Pipe Cactus National Monument, at points distant from military activity, and would not be expected to occur near military zones. The author concludes that "it appears that the data from radio-collared pronghorn indicates that the presence of a military use zone is not a factor in determining habitat use by Sonoran pronghorn." However, as the author correctly noted in regards to the paucity of localities at points distant from military zones, the localities of telemetered animals are probably related to the point of initial capture. Moreover, the use patterns and movements of the telemetered animals may or may not be representative of Sonoran pronghorn in general. The data presented by deVos (1989) do show that pronghorn can be found very close to and within areas of intensive military use. However, it does not indicate whether animals alter habitat use patterns or avoid, to some degree, active military zones.

Evidence suggests that ground-based activities, such as those of troops and vehicles at ground-support areas are likely to affect pronghorn habitat use. Sonoran pronghorn typically become alarmed and flee if humans on foot or vehicles approach closely (Laura Thompson-Olais, pers. comm. 1996). Wright and deVos (1986) noted that Sonoran pronghorn exhibit "a heightened response to human traffic" as compared to other subspecies of pronghorn. They noted that "once aware of an observer, Sonoran pronghorn are quick to leave the area. One herd was observed 1 1/2 hours later 18 kilometers north of the initial observation in October 1984. Other pronghorn have run until out of the observer's sight when disturbed." Hughes and Smith (1990) noted that on all but one occasion, pronghorn ran from their vehicle and continued to run until they were out of sight. Locality records illustrated in Figure 5 suggest that Sonoran pronghorn may avoid towns, highways, agriculture, and fences. All of this information indicates that Sonoran pronghorn would be expected to avoid areas where human use is occurring. In addition, encampments and years of repeated use by

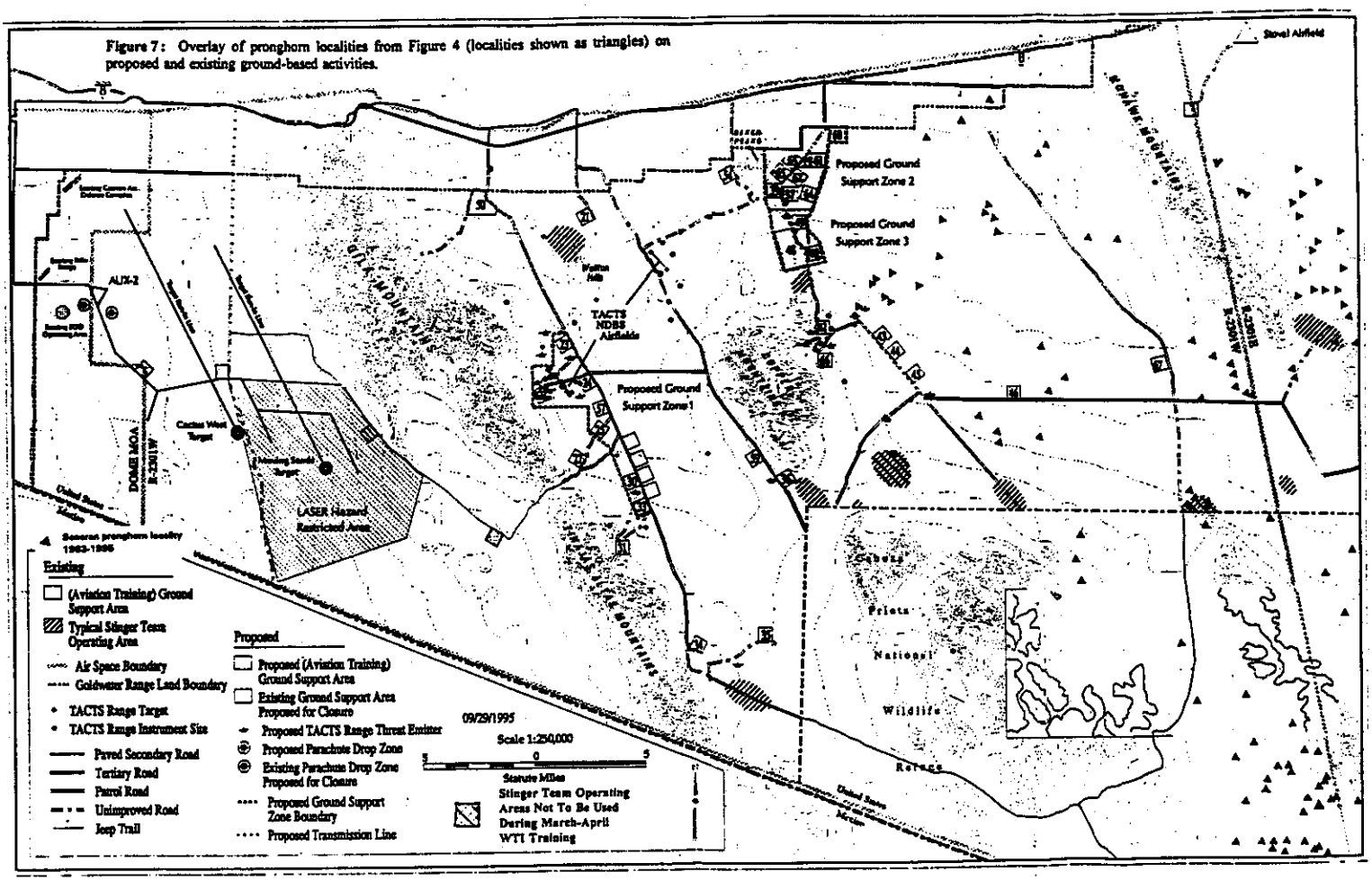
vehicles and troops have caused considerable surface disturbance and areas of "moondust" or highly eroded soils in ground-support areas (Dames and Moore 1995). This disturbance would be expected to reduce both perennial and ephemeral forage availability. Sonoran pronghorn move, in part, in response to forage availability (Wright and deVos 1986), thus areas of intensive ground activities may be avoided by pronghorn because of reduced forage availability as well as to avoid interactions with humans. In addition, oil and other hazardous materials spills could damage vegetation and create hazards for pronghorn and other animals.

Disturbance and flight of ungulates are known to result in a variety of physiological effects that are adverse, including elevated metabolism, lowered body weight, reduced fetus survival, and withdrawal from suitable habitat (Geist 1971). Mule deer disturbed by snowmobiles and humans on foot expended from 0.2 to 5.0 percent of their daily metabolizable energy in each encounter (Freddy et al. 1986). Frequent disturbance imposes a burden on the energy and nutrient supply of animals (Geist 1978), which may be exacerbated in harsh environments such as the Goldwater Range. Repeated stimuli commonly leads to habituation and reduced response (Harris 1943); however, animals should habituate reluctantly to stimuli that pose a threat (MacArthur et al. 1979). White-tailed deer, mule deer, and mountain sheep did not exhibit signs of habituation to persons on foot (Freddy et al. 1986, MacArthur et al. 1979, Moen et al. 1982). The physiological responses of Sonoran pronghorn to human disturbance has not been studied; however, these and other ungulate studies suggest that human disturbance may result in a number of adverse physiological changes.

Effects of Ground-based Activities in the Yuma Desert:

Figure 7 is an overlay of Sonoran pronghorn localities from 1983 to 1995 on proposed and ongoing ground-based activities. All proposed and ongoing activities in the Yuma Desert, west of the Gila and Tinaja Altas mountains, including the Cannon Air Defense Complex, rifle range, EOD operating area, AUX-2, Cactus West and Moving Sands targets, parachute drop zone, and four proposed ground support areas are clearly outside of the current range of the Sonoran pronghorn and thus would not affect the survival of Sonoran pronghorn or occupied habitat. This area is within the historic range of the Sonoran pronghorn and might be considered as a reintroduction site in the future as part of a recovery program (Service 1982, 1994a). Disturbance, such as foot and vehicle traffic at ground support areas, grading and use of targets, activities at AUX-2, the EOD operating area, and rifle range, could degrade habitat by removing cover and forage, and animals could avoid these areas because of the presence of humans, noise, vehicles, or other disturbance, if Sonoran pronghorn were translocated into or recolonize the area. However, these activities would affect a small proportion of the area west of the Gila and Tinajas Altas mountains (less than one percent of the approximately 315 mi^2 of habitat in this area) and, as a result, have a minimal affect on the recovery potential of the Sonoran pronghorn.

Figure 7: Overlay of pronghorn localities from Figure 4 (localities shown as triangles) on proposed and existing ground-based activities.



Effects of Ground-based Activities in the Lechuguilla Desert:

Ground support areas, stinger team operating areas; TACTS targets, instrument sites, airfields, and threat emitters; and roads existing or proposed west of the Baker Peaks, Copper Mountains, and Cabeza Prieta Mountains and east of the Gila and Tinaja Altas mountains (Lechuguilla Desert) are also west of all pronghorn localities shown on Figure 7 (a few unconfirmed recent sightings of pronghorn have been recorded west of the Cabeza Prieta Mountains). A greater potential exists for pronghorn to occur in this area as compared to the Yuma Desert (Service 1994a), but if pronghorn use the area, it is clearly not as important as other areas to the east and southeast (see Figure 5). The reason why this area is not used, or not used as heavily as areas to the east and southeast is unknown, but could be related to differences in forage or cover availability. This area is subject to more ground-based and aerial military activities than portions of Cabeza Prieta NWR and Organ Pipe Cactus National Monument that are used heavily by pronghorn. The greater level of military activity in the Lechuguilla Desert could conceivably contribute to this relatively low use by pronghorn.

The greatest impact from ongoing and proposed ground-based military activities in the Lechuguilla Desert would likely result from activities in ground-support areas. Base camps, mobile radar sites, communications facilities, and anti-aircraft missile sites at support areas all contribute to localized extensive habitat disturbance caused primarily by heavy vehicle and equipment tracks and foot traffic of up to hundreds of troops (MCAS 1995). Sixteen ground-support areas occur in this area and cover approximately 6.24 mi^2 of potential Sonoran pronghorn habitat. Four of the sixteen ground support areas are proposed to be closed (approximately 1.6 mi^2) and managed to promote revegetation by native plant communities (MCAS - Yuma 1995). However, a large ground-support zone (zone 1) is proposed on the east side of the Gila and Tinajas Altas mountains. This zone would consolidate seven of the existing ground support areas plus adjacent areas into a contiguous area of approximately 7.9 mi^2. Total area devoted to ground support proposed in the Lechuguilla Desert is approximately 11.4 mi^2. This area, which would all be subject to new or ongoing surface disturbance, represents approximately four percent of the land area in the Lechuguilla Desert south of Interstate 8 and north of the International border.

Other proposed and ongoing ground-based activities in the Lechuguilla Desert are expected to cause minimal disturbance to habitat and pronghorns. The stinger teams would typically use operating areas shown on Figure 1, but could use other areas as well. Two to four man teams would access areas via existing roads and then move to remote locations on foot. Vehicles and troops could result in some pronghorn flushing from cover and moving some distance away (Workman et al. 1992, Wright and deVos 1986), but because pronghorn are rare or absent in this area, the probability of teams encountering them is low. Flushing or disturbance of pronghorn as a result of other activities, such as military and recreational vehicle use of roads, use of TACTS airfields, and construction and maintenance of the TACTS threat emitter sites is similarly low. Threat emitters would be designed so that hazardous radiation would not reach ground levels and thus would not affect pronghorn (Dames and Moore 1995).

Effects of Ground-based Activities East of the Baker Peaks, and Copper and Cabeza Prieta Mountains:

Numerous Sonoran pronghorn have been located in recent years in R-2301W on the Goldwater Range and the Cabeza Prieta NWR east of the Baker Peaks, Copper, and Cabeza Prieta mountains (Figure 7). In this area, ongoing and proposed military ground-based activities have the greatest potential for adversely affecting Sonoran pronghorn. Of those activities, existing and proposed ground support areas would likely cause the greatest habitat disturbance and potential for disturbing pronghorn. East of Baker Peaks and the Copper and Cabeza Prieta mountains, a total of approximately 21 mi^2 are proposed for ground support. Included is an approximately 16.5 mi^2 area just east of Baker Peaks (ground support zones 2 and 3). Another approximately 3.5 mi^2 of ground support areas exist along roads, including the Stoval Airfield in R-2301E. Activities in these areas would degrade habitat for pronghorn and may cause disturbance to individual animals or discourage use of the area (Workman et al. 1992, Wright and deVos 1986). The Stoval Airfield and ground support zones 2 and 3 are somewhat north of pronghorn localities shown on Figure 7, but they are considered within the current range of this animal (Service 1994a, Dames and Moore 1995). Approximately 665 mi^2 of Sonoran pronghorn habitat occurs east of Baker Peaks and the Copper and Cabeza Prieta mountains on Figure 7; thus existing and proposed ground support areas would affect approximately three percent of pronghorn habitat in this area.

Other proposed ground-based activities east of the Baker Peaks and Copper and Cabeza Prieta mountains include stinger team operating areas, TACTS range threat emitters, a proposed transmission line along an existing road, use of existing roads, and TACTS range instrument sites. As described above for these proposed activities in the Lechuguilla Desert, the effects of these activities on pronghorn habitat are, for the most part, expected to be minimal and will likely cause minimal disturbance to pronghorn, because they are very localized, or in the case of stinger team operating areas, are temporary in nature. A stinger team operating area at the north end of the Sierra Pinta Mountains is frequented by pronghorn (Figure 7), suggesting that this activity does not preclude pronghorn use. However, this area and one other were considered particularly sensitive by the Sonoran Pronghorn Core Working Group (February 22, 1996, meeting). MCAS - Yuma agreed at that meeting not to use these areas during the March-April WTI course, when pronghorn may be with fawns and would be most sensitive to human disturbance (Figure 1). In comparison to the Lechuguilla Desert, pronghorn are more likely to be encountered on roads, in stinger operating areas, and other project sites, thus the potential is greater for disturbing animals or for causing habitat disturbance that may affect pronghorn.

Over the entire project area as shown in Figure 7, ground-support areas in potentially occupied habitat (east of the Tinajas Altas and Gila mountains) would encompass approximately 32.4 mi^2. Approximately 950 mi^2 of potential habitat occurs in the project area; thus activities at ground support areas would cause habitat degradation and disturbance to pronghorn in approximately 3.6 percent of potential pronghorn habitat in this area.

Approximately 7,720 mi^2 of habitat occurs in the United States, which is somewhat less than half of the range of the species (Wright and deVos 1986).

Effects of HAWK Missile Exercises:

Live HAWK missiles are fired during exercises that occur from one to three times annually. Missiles either impact drone aircraft or are detonated remotely in the air. Shrapnel from missiles and aircraft parts typically impact in the Mohawk Valley north of Cabeza Prieta NWR. Potential exists for shrapnel to strike and kill or injure a pronghorn; however, pronghorn are not commonly observed in this area (Figure 5). Because of the infrequency of this exercise and the low density of pronghorn in this area, injury or mortality of pronghorn as a result of an impact by HAWK missile shrapnel is considered unlikely.

Overview - Effects of Military Overflights:

Compared to ground-based activities, overflights do not cause habitat degradation, but ungulates may respond with increased heart rates and may flee from aircraft in a response similar to ground-based stimuli (Weisenberger et al. 1996, Krausman et al. 1986, Workman et al. 1992, Hughes and Smith 1990). Captive desert mule deer and mountain sheep generally exhibited elevated heart rates in response to simulated aircraft noise and the loudest noises caused the greatest increases in heart rate (Weisenberger et al. 1996). Weisenberger et al. (1996) found that their test animals habituated rapidly to aircraft noise and postulated that the animals did not consider the noise a threat. In a study of disturbance effects to pronghorn in Utah, sonic booms and subsonic aircraft flyovers caused elevated heart rates (Workman et al. 1992). Pronghorn exhibited the greatest response to a hovering Huey helicopter flown at 500 feet AGL (Workman et al. 1992). Luz and Smith (1976) found that pronghorn ran from a low-flying helicopter. Habituation by pronghorn to sonic booms and low-level overflights by F-16 aircraft and Huey helicopters was observed by Workman et al. (1992). However, pronghorn did not habituate to low-level hovering by a Huey helicopter. Low-level flyovers by a Cessna 182 elicited apparent habituation in one pronghorn but not another. Weisenberger et al. (1996) found that mountain sheep and mule deer responded more frequently to aircraft noise in the summer months as compared to late summer or spring. They concluded that exposures of mountain sheep and deer to jet aircraft noise were of such short duration that this type of noise could not be considered detrimental (ie. inhibiting reproductive mechanisms). However, the authors noted that there may be additional or interactive effects from the visual stimulus of aircraft, and that additional work is needed on free-ranging animals and actual aircraft. Krausman and Hervert (1983) found that 41 percent of mountain sheep were disturbed by fixed-wing aircraft used to survey these animals. More than 19 percent of their study animals moved to different habitats, presumably in response to disturbance caused by surveys. Krausman et al. (1986) found that desert mule deer were disturbed to a lesser degree and only three percent changed habitats in response to aircraft disturbance. Mule deer apparently habituated to the survey aircraft.

Response of Sonoran pronghorn to fixed-wing aircraft and helicopters has not been studied, but may be similar to the responses of other ungulates, and particularly other subspecies of pronghorn. Sonoran pronghorn would likely exhibit more intense response to low-level helicopter flights, because helicopters travel at a much slower speed than jets, thus the duration of exposure would be greater. In examining response of pronghorn to aircraft, Workman et al. (1992) found that the greatest response was elicited by a hovering helicopter. Pronghorn would be expected to move greater distances and respond for a longer period of time to helicopters than to fixed-wing aircraft. Evidence suggests that pronghorn may habituate to disturbance from moving helicopters; however, they may not habituate to low-level hovering helicopters (Workman et al. 1992).

Effects of Helicopter Overflights:

Helicopters currently use eleven flight corridors over the Cabeza Prieta NWR, but MCAS proposes to reduce this number to three primary corridors (Figures 3 and 4). Helicopter use elsewhere on the Goldwater Range can occur anywhere and at any time. All helicopter flights are at 50 to 1,500 AGL (MCAS - Yuma 1995). Helicopter flights over Cabeza Prieta NWR occur only during WTI courses (March-April and October-November). During the five days of a typical WTI course one flight of two to eight CH-53 and AH-1 helicopters (200 to 300 feet between aircraft) fly from west to east through the corridors to target areas north and east of the Refuge, where they may deliver ordnance to existing target areas. The helicopters return to MCAS - Yuma via northern routes outside the refuge. Sixty percent of flights occur at night (MCAS - Yuma 1995). A typical flight of four aircraft takes approximately 30 minutes to traverse the WTI course on the Refuge. Thus, at a frequency of one flight per day for five days, approximately 2.5 hours of flight time over the refuge occurs per WTI course. Additional flight time for a total of up to five hours is sometimes needed, thus total annual flight time for both WTI courses is approximately five to ten hours (MCAS - Yuma 1995). The only proposed changes in helicopter flight activity are that the number of corridors over the Refuge would be reduced from 11 to three and the total length of corridors would decrease from 146 to approximately 137 nautical miles. Elsewhere in R-2301W east of the Gila Mountains, up to 200 helicopter sorties occur per month, both at night and during the day, particularly in March, April, October, and November (MCAS - Yuma 1995). Assuming a flight time per sortie of one hour, up to 200 hours of helicopter flight time occurs monthly over R-2301W east of the Gila Mountains and exclusive of Cabeza Prieta NWR. No changes in helicopter use on the Goldwater Range exclusive of Cabeza Prieta NWR are proposed.

No quantitative data exist to evaluate the effects of low-level helicopter flights on Sonoran pronghorn. A single anecdotal observation was noted by L. Thompson-Olais (pers. comm. 1996). During a flight to retrieve a transmitter, a Border patrol helicopter flew at an elevation of less than 200 feet over a group of about five bedded Sonoran pronghorn. Some of the animals got to their feet and ran from the helicopter. Limited quantitative information is available to evaluate the effects of helicopter overflights on other subspecies of pronghorn (Workman et al. 1992). However, use of this information to evaluate the effects of low-level

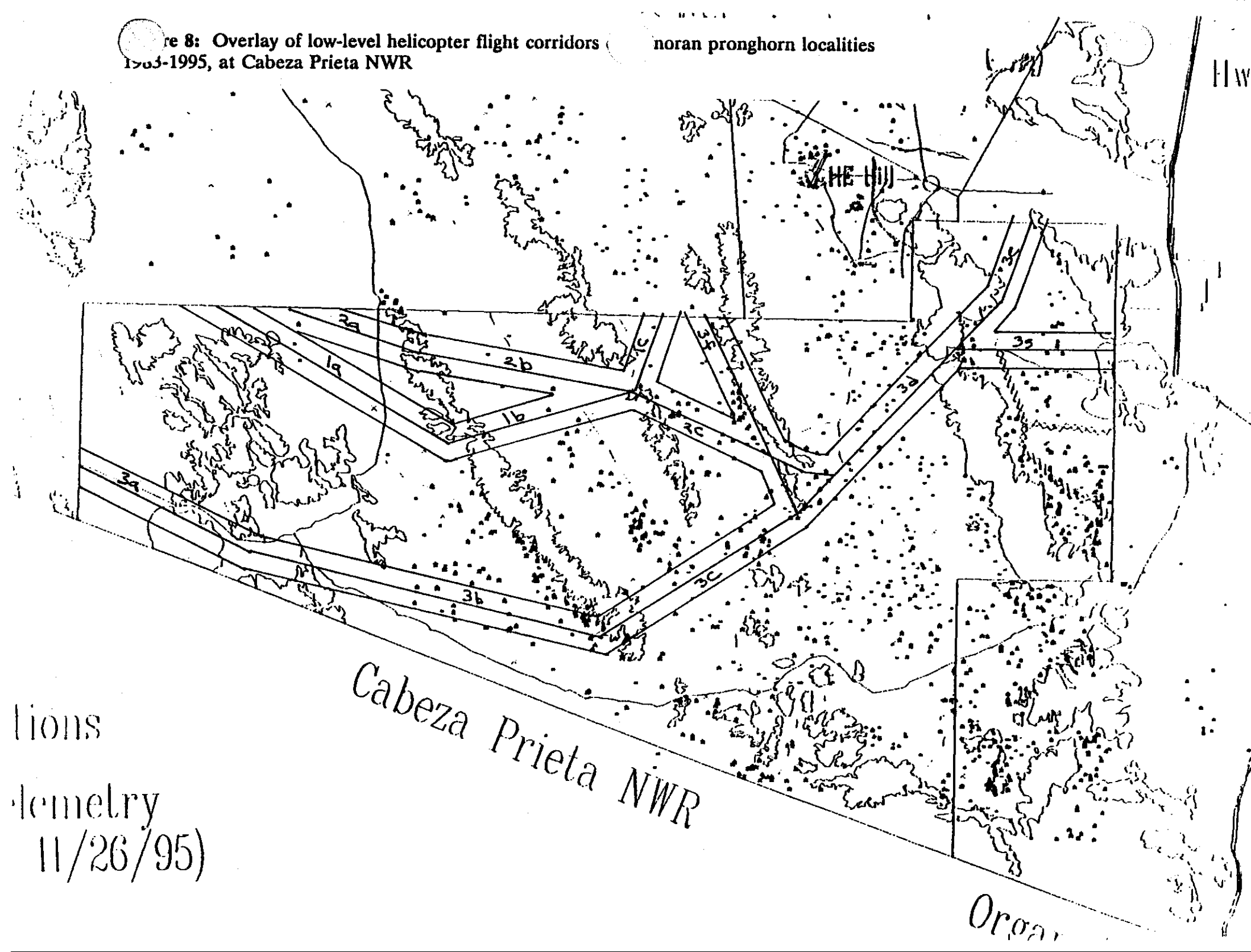
flights on the Sonoran pronghorn is speculative at best because this information was collected for another subspecies of pronghorn in a much different environment, helicopter flights on the Goldwater Range occur at both lesser and greater altitudes than in that study, different types of helicopters are flown on the Goldwater Range, helicopter flights occur both at night and during the day, whereas Workman et al. (1992) only investigated pronghorn response to day flights, and other aspects of the nature of disturbance, such as groups of helicopters versus single helicopters and the frequency or seasonality of flights is different between the Goldwater Range and Workman et al.'s study. In addition, sound transmission may be different between Workman's study area and the Goldwater Range, due to shielding by vegetation or climatic conditions.

Nevertheless, if we assume Sonoran pronghorn respond in a similar manner to helicopters as other ungulates, some broad statements of the possible effects can be made. In general, areas or times of year with greater use by low-level helicopters will have the potential for the greatest disturbance to pronghorn. Also, in areas where helicopters fly particularly low and thus create more noise and greater visual stimuli, disturbance to pronghorn would be expected to be greater (see Weisenberger et al. 1996, Workman et al. 1992). Disturbance of pronghorn on Cabeza Prieta NWR as a result of military helicopter overflights would be nonexistent for approximately 10 months out of each year because military helicopters only fly over the Refuge during the WTI courses. However, during those courses, and in the flight corridors, pronghorn would be exposed to approximately one flight of a group of helicopters per day. Elsewhere in R-2301W east of the Gila Mountains, the frequency of helicopter flights is much greater (approximately 2,400 hours versus five hours annually of flight time) and helicopter flights occur year-round. However, based on the numbers of locality records (Figure 5), the importance of the Refuge to pronghorn is disproportionate to the rest of R-2301W, thus the WTI corridors are of particular concern.

As discussed above, evidence from other subspecies of pronghorn and other ungulates suggest that disturbed Sonoran pronghorn may exhibit elevated heart rates, may flee, and could alter habitat use in response to low-level helicopter flights. Physiological changes associated with flight and disturbance-related stress may be similar to those described above for ground-based disturbance and could include elevated metabolism, reduced body weight, and reduced fetus survival. However, no data specific to the Sonoran pronghorn exist to support or disclaim these possible adverse effects.

Figure 8 displays an overlay of Sonoran pronghorn localities on proposed helicopter flight corridors over the Cabeza Prieta NWR. Concern over possible adverse effects to pronghorn as a result of low-level helicopter flights prompted MCAS - Yuma to revise their original low-level helicopter flight proposal presented in the biological assessment and dEIS. Of particular concern were existing and proposed corridors along the west slope of the Sierra Pinta Mountains, especially at the south end, existing and proposed corridors over the Antelope Hills and the southern end of the Granite Mountains, and a proposed corridor that passed over an area of concentrated pronghorn use on the north end of the Sierra Pinta

re 8: Overlay of low-level helicopter flight corridors noran pronghorn localities
1983-1995, at Cabeza Prieta NWR



lions

lemetry
11/26/95)

Mountains. In discussions with this office, Cabeza Prieta NWR, and other members of the Sonoran Pronghorn Core Working Group, MCAS - Yuma agreed to revise their proposal to reduce possible adverse effects to pronghorn. Revisions included elimination of the route along the west slope of the Sierra Pinta Mountains, combining two proposed routes into route 3c and locating that route north of the Antelope Hills, and moving the turning point between routes 2a and 2b to the south to avoid the use area at the north end of the Sierra Pinta Mountains (see Figure 8). Concerns over possible adverse effects to the lesser long-nosed bat resulted in elimination of route 2d and creation of route 3g (see CONCURRENCES section). This change is considered neutral in regards to effects to pronghorn. In response to concerns about possible adverse effects to pronghorn on the western slope of the Granite Mountains, MCAS - Yuma agreed to raise the minimum flight elevation from 50 feet AGL to 500 feet AGL.

The most important differences between the existing and revised proposed corridors in regards to effects to pronghorn are that the revisions do not pass over the west slope of the Sierra Pinta Mountains or the west slope of the Bryan Mountains, and the corridor along the west slope of the Granite Mountains is elevated to 500 feet AGL; however, the revised routes pass over the Pinta Sands and the south end of Childs Mountain, both of which have not experienced helicopter overflights under the existing scenario.

Effects of Fixed-Wing Aircraft Overflights:

An average of approximately 21,000 fixed-wing aircraft sorties (maximum of 33,000, minimum of 12,000) occur annually in airspace R-2301W. Eighteen percent or approximately 3,780 of these are low-level (200 to 1,500 AGL) flights. Most flights occur during the day and are fairly evenly distributed among months of the year. Eight types of fixed-wing aircraft were used in R-2301W from fiscal year 89 through 92 (MCAS - Yuma 1995). Currently, low-level flights over the Cabeza Prieta NWR occur only during WTI courses and only in two corridors four nautical miles in width (Figure 9). Typically, five flights of four to eight aircraft occur per day for six days during each WTI course; 85 percent of those occur during daylight hours. Aircraft transit time through the Refuge averages 7 minutes, thus total flight time over the Refuge by groups of aircraft per course is 3.5 hours. Additional flights sometimes occur for a total flight time of up to 7.0 hours per course and 7.0 to 14.0 hours per year. Distribution of flights in the two corridors is roughly equal. MCAS - Yuma proposes to authorize use of the two corridors for up to 60 days per year, including the 12 days of WTI courses as well as other times of the year. Flight time in the corridors would increase to as much as 70 hours per year.

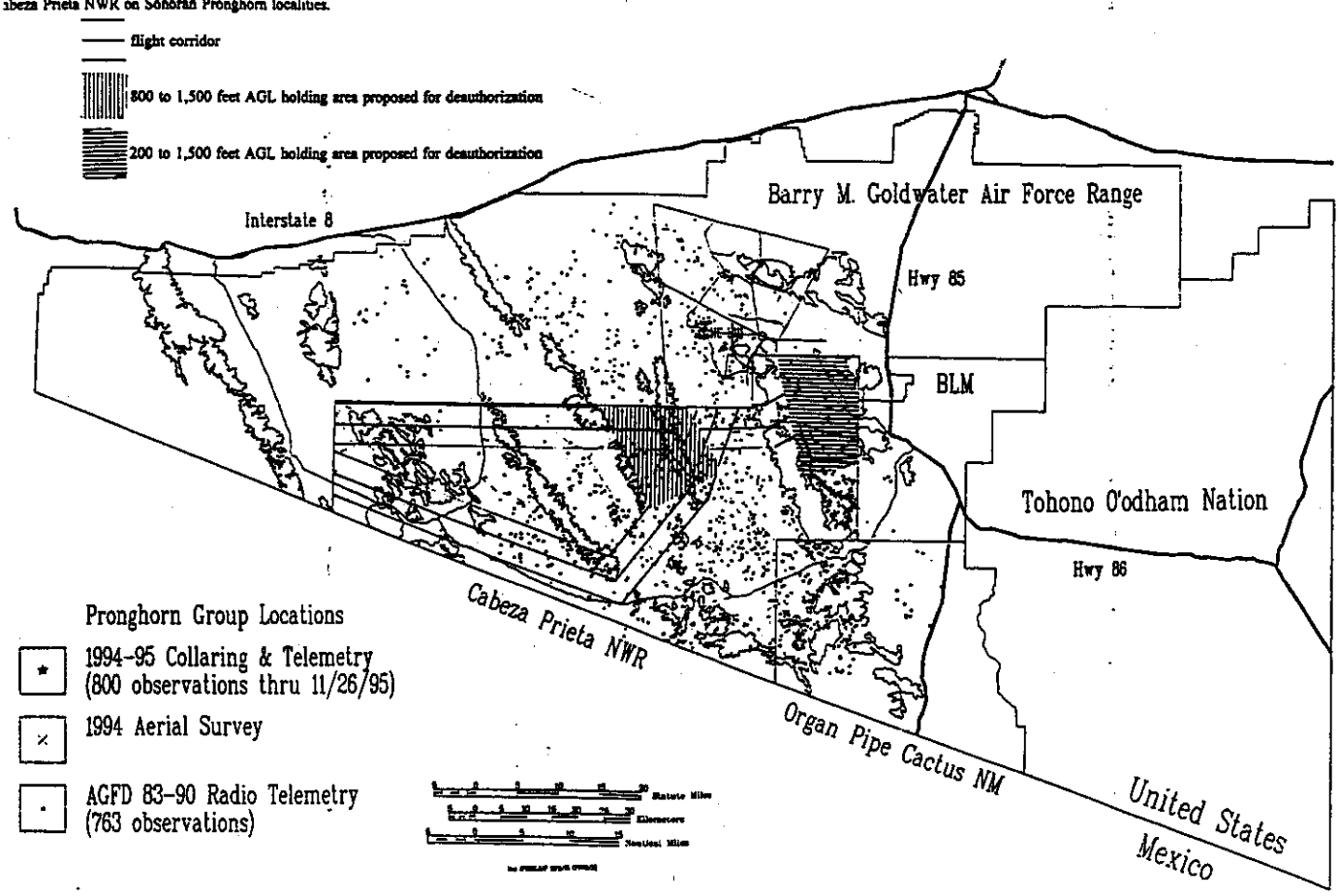
Approximately 3,720 low-level, fixed-wing aircraft sorties occur per year within R-2301W, exclusive of Cabeza Prieta NWR. Assuming an average transit time of 14 minutes (twice the transit time through the refuge), approximately 870 hours of low-level, fixed-wing flights occur over R-2301W annually.

As with the analysis of the effects of helicopter overflights, data are insufficient to quantify the effects of low-level, fixed-wing aircraft flights on Sonoran pronghorn. However, the literature on other ungulates and anecdotal notes on Sonoran pronghorn suggest that responses to this form of disturbance are minimal and of short duration (Hughes and Smith 1990, Workman et al. 1992, Weisenberger et al. 1996). An anecdotal account of an encounter between low-level jet aircraft and pronghorn is found in Hughes and Smith (1990). They observed 2 adult male and an adult female Sonoran pronghorn that were directly under the path of four to five low-level jets. The males were interacting, chasing each other and exhibiting aggressive postures, while the female remained relatively inactive and watched the males. The pronghorn moved approximately 100 meters in response to the aircraft, but then quickly resumed their interactive behaviors. J. Hervert (pers. comm. 1996) observed four encounters between Sonoran pronghorn and low-level jet aircraft. Pronghorn showed no visible response in three of the encounters and in the fourth a pronghorn with a fawn moved approximately 100 meters, apparently in response to the aircraft. During weekly telemetry flights with a Cessna 182 at 1,000 feet AGL, Sonoran pronghorn were often disturbed and some animals would flee from the plane. After 14 months of flights, some animals were observed to still run from the plane (L. Thompson-Olais, pers. comm. 1996). These anecdotal observations of Sonoran pronghorn responses to fixed-wing aircraft may or may not be representative.

Other subspecies of pronghorn typically exhibit a lower frequency and intensity of response to low-level fixed-wing aircraft and may habituate more rapidly as compared to low-level helicopter flights (Workman et al. 1992). Annual fixed-wing flight time by MCAS is more than four times that of helicopters in R-2301W (MCAS - Yuma 1995). Thus, there is a greater potential for interaction between fixed-wing aircraft and pronghorn. Despite the frequency of overflights, some individual pronghorn have not completely habituated to them and will flee at least short distances (Hughes and Smith 1990).

Figure 9 is an overlay of pronghorn localities on low-level fixed-wing flight corridors and holding areas on the Cabeza Prieta NWR (holding areas are proposed for deauthorization). Approximately 0.3 percent of low-level fixed-wing flights in R-2301W authorized by MCAS-Yuma occur over the Refuge (this would increase to approximately 1.8 percent under the proposed action); however, the importance of the Refuge for the pronghorn is disproportionate to the rest of R-2301W (Figure 9). Thus, these corridors and holding areas warrant site-specific discussion. The western portions of the corridors, from the Cabeza Prieta Mountains west to the boundary of the Refuge, and routes aircraft would take to travel from MCAS-Yuma to the Refuge are outside of areas where pronghorn were recorded from 1983 to 1995. The central and eastern portions of the southern corridor passes over the Pinta Sands area, the base of the Sierra Pinta range, an area between the Antelope Hills and the Bryan Mountains, and a portion of Growler Valley, all of which are frequented by pronghorn. The eastern portion of the northern corridor crosses the following areas that yielded significant numbers of localities from 1983 to 1995: the Growler Valley, Charlie Bell Pass, the base of the Granite Mountains, and the west side of Childs Mountain. Behaviors of pronghorn exposed to low-level flights in these corridors may be temporarily

ibeza Prieta NWR on Sonoran Pronghorn localities.



disrupted or animals may flee short distances (Hughes and Smith 1990; J. Hervert, pers. comm. 1996; Workman et al. 1992). Proposed use of these corridors outside of the March and October-November WTI courses and for up to five times the current annual flight time will increase exposure of pronghorn on the Refuge and potential disturbance to them as a result of this activity.

Deauthorization of the holding areas would remove low-level aircraft flights from several areas that have yielded significant numbers of localities (Figure 9). These areas include a portion of the San Cristobal Valley and the Daniels Arroyo area. Potential disturbance of pronghorn in these areas as a result of low-level, fixed-wing Marine Corps aircraft would be eliminated.

Approximately 27,900 hours of fixed-wing flight time occurs annually in R-2301W above 1,500 feet elevation (Dames and Moore 1995). Most of these flights are probably audible and may be visible to pronghorn. The effects of these higher-elevation flights on pronghorn have not been studied, but are presumably less likely to elicit a response than low-level flights. Presumably, aircraft at high AGL produce less visual and auditory stimuli, decreasing the likelihood that pronghorn would respond.

Effects of Ordnance Delivery:

During WTI courses, aircraft authorized by MCAS - Yuma to fly through the R-2301W airspace may deliver live ordnance on established targets in the North and South Tactical Ranges of the Goldwater Range (just north of the eastern end of Cabeza Prieta NWR). Habitat on the targets is degraded from a long history of use by the Air Force and other military users; thus the potential for habitat damage from ordnance delivery is low. However, pronghorn use both the North and South Tactical Ranges and ordnance or shrapnel could potentially strike and kill or injure a pronghorn. In addition, pronghorn could be killed or injured during an encounter with unexploded live ordnance on the ground. No pronghorn are known to have been harmed by ordnance or shrapnel, but killed or injured animals would probably quickly succumb to predators or scavengers and would leave little evidence. A group of pronghorn have been seen regularly in the vicinity of a bomb crater that seasonally fills with water near HE Hill on the South Tactical Range (Figure 9), and may be at risk (Robert Barry, Wildlife Biologist, Luke Air Force Base, pers. comm., 1996). Extensive use of these tactical ranges is authorized by Luke Air Force Base. The Air Force, MCAS - Yuma, the Service, and others have discussed initiation of monitoring studies to determine the effects of ordnance delivery at HE Hill on pronghorn.

<u>Flat-tailed Horned Lizard</u>

Use of access roads in flat-tailed horned lizard habitat, particularly the road to AUX-2 and east to Fortuna Road, would result in flat-tailed horned lizards occasionally being crushed or injured by passing vehicles. Any vehicle use off-road for emergency purposes or a "bona fide management need" would result in habitat disturbance, and possibly result in direct

mortality or injury of horned lizards. In addition, military vehicles or military personnel in private vehicles may crush flat-tailed horned lizards on roads outside of the Goldwater Range. Flat-tailed horned lizards may be crushed by vehicles travelling on County 19 or Avenue B, leading to AUX-2, the rifle range, and other facilities to the east and south. Flat-tailed horned lizards may also be crushed on County 14, which is the access route to the Cannon Air Defense Complex. Horned lizards are sometimes collected as pets. Military and civilian personnel on the Goldwater Range could potentially collect flat-tailed horned lizards and remove them from the Range.

Aircraft landings and takeoffs at AUX-2 airfield may result in mortality of flat-tailed horned lizards that are burned by jet exhaust. Construction of a new AV-8B runway and AV-8B landing pads would result in loss of approximately 16.6 acres of flat-tailed horned lizard habitat. Retrieval by vehicles of tow banners in the tow banner drop zone adjacent to AUX-2 could also result in crushing of flat-tailed horned lizards.

Aircraft noise at AUX-2 could result in hearing loss and altered behavior by flat-tailed horned lizards. Brattstrom and Bondello (1980) tested the responses of the Mojave fringe-toed lizard, *Uma scoparia*, to dune buggy sounds. Dune buggy noise at 95 decibels (dBA) for a cumulative exposure time of 500 seconds was sufficient to cause severe hearing loss in test animals for several days. The Mojave fringe-toed lizard has external ear openings, whereas the flat-tailed horned lizard does not, suggesting the flat-tailed horned lizard may be less sensitive to noise. However, aircraft noise within 2,000 feet of AUX-2 would likely exceed 100 dBA (Dames and Moore 1995). Repeated exposure could possibly damage the hearing of lizards in the area. The effect of temporary or permanent hearing loss in the flat-tailed horned lizard is unknown, but could potentially result in altered behavior and reduced survivorship. Overflights of military aircraft are much less likely to affect the flat-tailed horned lizard because noise levels would be significantly less and the duration of exposure would be short.

Based on locality records and surveys of the site (Dames and Moore 1995, Figure 6), the Moving Sands target is likely outside of the range of the flat-tailed horned lizard. Thus, ongoing and proposed activities there would not likely affect the species. The Cactus West target is likely within the range of the species (Figure 6), but intensive surveys at and near the site (Dames and Moore 1995) failed to locate any flat-tailed horned lizards, indicating the species is probably rare or absent. If the species is present, lizards could be killed during grading of the target, access and maintenance of the target, EOD clearances, and delivery of ordnance. Proposed construction of simulated target scenarios would also have the potential for resulting in mortality. Proposed cessation of grading the Cactus West run-in line would allow graded areas to recover from disturbance. Grading of this run-in line in the past probably resulted in mortality of flat-tailed horned lizards, removal of perennial shrubs, and disturbance of surface soils.

Dames and Moore (1995) argue that because scat counts at Moving Sands target were similar to counts in adjacent habitat, target use and maintenance may not adversely affect horned

lizards (Dames and Moore 1995). However, flat-tailed horned lizards probably do not occur at this site (observed scat may have been desert horned lizard scat, also see Figure 6), scat counts may not be a good indication of relative abundance (Hodges 1995, Rorabaugh 1994), and a comparison of current densities of flat-tailed horned lizards on and off the target is not an appropriate method to evaluate the effects of the target (densities at the target may have been higher than in adjacent habitat before that target was constructed).

Relatively high scat counts in the section in which the existing parachute drop zone is located (Dames and Moore 1995) and numerous flat-tailed horned lizard sightings on the road along AUX-2, suggest that this area supports a relatively dense population of flat-tailed horned lizards. Recovery of cargo pallets dropped by C-130 aircraft in the drop zone likely has resulted in disturbance of habitat and probably mortality of lizards. MCAS - Yuma proposes to relocate the drop zone to the abandoned Rakish Litter target area at T10S, R22W, section 22 and 26. Within the Rakish Litter target area, the drop zone would likely be relocated to the northern target site in section 26 and disturbance would be within the 1,500-foot radius target area. This area has not been surveyed, but previous disturbance at the site has likely reduced the habitat suitability for the flat-tailed horned lizard. Use of a high-clearance vehicle and a fork lift to retrieve cargo pallets would cause further disturbance of the abandoned target area. Although previously disturbed, this area likely still supports flat-tailed horned lizards and animals could be killed or injured by off-road vehicles. Under the proposed action, the existing parachute drop zone will slowly recover from disturbance and horned lizards using the area would no longer be subject to death or injury from cargo pallet recovery.

The EOD Operating Area and access road from AUX-2 has resulted in an estimated 4.0 acres of disturbance to flat-tailed horned lizard habitat. The site, located in the northern half of T10S, R22E, section 33, consists of a number of burn pits and trenches in which explosive ordnance is detonated (Bill Fisher, pers. comm. 1996). The site has not been surveyed for horned lizards; however, habitat appears suitable and flat-tailed horned lizards have been observed on the paved road south of AUX-2, approximately 0.75 mile to the east (Hodges 1995). Horned lizards could be killed or injured during detonation of ordnance and by vehicles accessing the site. Under the proposed action, the site would not be expanded or relocated, thus no additional habitat disturbance would occur.

The rifle range and Cannon Air Defense Complex are existing facilities and no changes to them have been proposed. Both sites are within flat-tailed horned lizard habitat (Figure 6). Flat-tailed horned lizards could be killed by vehicle or equipment use at either site, and as mentioned above, lizards could be crushed on access roads to these areas or collected by personnel.

MCAS - Yuma proposes establishment of two ground support areas potentially within the range of the flat-tailed horned lizard. These areas would be subjected to off-road activity by heavy trucks and heavy foot traffic by up to hundreds of troops, particularly in base camps and other areas of troop concentrations. Each ground support area would impact up to 0.39

mi^2 (MCAS - Yuma 1995). Repeated use is expected to reduce cover by perennial shrubs, cause disturbance of surface soils, and probably reduce densities or eliminate flat-tailed horned lizards from all or portions of the ground support areas. The precise locations of the ground support areas are unknown, but would be determined, in part, by flat-tailed horned lizard surveys. MCAS - Yuma proposes to locate them in areas of low habitat suitability for the species (Dames and Moore 1995). If they are located as shown in Figure 1, the eastern area (adjacent to Fortuna Road) may be outside of flat-tailed horned lizard habitat (Figure 6). Flat-tailed horned lizards have been found along the road adjacent to the western ground support area and it is presumed to be habitat for the species.

Disturbance of surface soils results from off-road vehicle use, grading of targets, foot traffic and camps at ground support areas, and other military activities. Soil disturbance can cause long-term changes in vegetation composition (Vasek et al. 1975a&b, Wells 1961) and may promote establishment of non-native plants (see Appendix D of Service 1994b, Brooks 1992), particularly European and Asian annuals such as tumbleweed, *Salsola kali*, Sahara mustard, *Brassica tournefortii*, and Mediterranean grass, *Schismus barbatus*. These annual plants have an unknown effect on flat-tailed horned lizard habitat suitability, but can promote fire and destruction of native perennial shrubs (Brooks 1995, Minnich 1994). In some areas within the range of the flat-tailed horned lizard, stem and culm densities of non-native annuals may, in years with high rainfall, be great enough to impede movement by horned lizards. In addition, changes in plant communities could promote changes in ant communities, which could, in turn, affect horned lizard populations.

Military activities have the potential for attracting predators of flat-tailed horned lizards. Loggerhead shrikes, *Lanius ludovicianus*, may be attracted to perch sites, such as antennas, towers, etc. Common ravens, *Corvus corax*, may be attracted to trash or water. The loggerhead shrike is a known predator of flat-tailed horned lizards (Duncan et al. 1994, Hodges 1995); the common raven is potentially a predator (Duncan et al. 1994). The effect of predation on horned lizard populations is unknown; however, elevated predation levels could potentially cause localized reductions in lizard populations.

Spills of hazardous materials, such as fuels, oil, etc. could be toxic to flat-tailed horned lizards and native plants. Without proper containment and hazardous materials cleanup procedures, materials used at the Goldwater Range by MCAS - Yuma could pose a localized threat to individual flat-tailed horned lizards and their habitat.

Effectiveness of Proposed Mitigation

<u>Sonoran Pronghorn</u>

During the consultation process, MCAS - Yuma proposed limiting use of two stinger team operating areas and developed revisions to the low-level helicopter flight corridors over the Cabeza Prieta NWR to reduce adverse effects to the Sonoran pronghorn. Also proposed is a cooperative study and planning effort with Luke AFB to study pronghorn use and threats at

target sites on the North and South tactical ranges. The results of the study would be used to develop mitigative measures to reduce possible hazards to pronghorn from ordnance delivery and unexploded ordnance. The effectiveness of this measure is uncertain because the extent of possible hazards to pronghorn and the range of possible mitigation measures will not be known until the study is complete. In addition, monitoring of target areas and implementation of ground-based mitigation measures is not at the discretion of MCAS - Yuma. The North and South tactical ranges are administered by Luke AFB; thus any recommendations to monitor these ranges with ground-based personnel or cameras, or mitigation measures such as fencing could not be implemented without the permission of Luke AFB. The Service is very concerned that delivery of ordnance by MCAS - Yuma, Luke Air Force Base, and others at targets on the North and South tactical ranges could result in take of Sonoran pronghorn. Because MCAS - Yuma does not manage these ranges and the WTI courses represent only a small part of the overall use of them, an analysis of the effects of ordnance delivery at the North and South tactical ranges would be more appropriately addressed in a consultation with Luke Air Force Base.

In addition to species-specific measures just discussed, many proposed general mitigation actions would act to reduce adverse effects of the proposed action to the Sonoran pronghorn and its habitat. A user-education program that includes information about regulations and protection for listed species, restricting vehicle use to existing roads except in specific areas or in the case of an emergency or bona-fide management need, monitoring of regulation compliance, construction practices that reduce erosion and limit disturbance of drainages, and pollution and hazardous materials control measures would all act to reduce possible adverse effects to the Sonoran pronghorn. The "Sonoran Pronghorn Reproduction/Recruitment Study", contracted by MCAS - Yuma to Arizona Game and Fish Department will provide much needed baseline data on the species, and has already generated valuable locality data used herein (1994-1995 data on Figure 5).

Flat-tailed Horned Lizard

MCAS - Yuma has proposed a number of actions that would act to limit or mitigate many of the adverse effects of the proposed action (Dames and Moore 1995). Development and implementation of a Range user education program that includes discussion of the flat-tailed horned lizard and regulations concerning it would help minimize disturbance of habitat and "take" of lizards, and promote compliance with regulations and measures to reduce adverse effects to this species. Monitoring of construction projects, relocation of flat-tailed horned lizards in construction areas, and flagging of construction sites would minimize mortality and injury of flat-tailed horned lizards and reduce habitat disturbance during construction activities. Signs, gates, and other control measures at entrances to the Goldwater Range should discourage unauthorized use of the range and habitat disturbance and mortality of lizards that accompanies that activity. Cooperating with State and other Federal agencies in the development of a Rangewide Management Strategy and conservation agreement for the species, and continuing to support basic research on the flat-tailed horned lizard, will contribute to development and implementation of management necessary to support viable

populations of flat-tailed horned lizards. MCAS - Yuma has proposed vehicle speed limits to reduce mortality of flat-tailed horned lizards on roadways. However, flat-tailed horned lizards often freeze on the pavement in response to an approaching vehicle. Also, speed limits low enough (perhaps 15-20 miles per hour) to allow those lizards that do flee to avoid being crushed may not be reasonable or enforceable. Therefore, the Service believes proposed speed limits probably will not reduce mortality of flat-tailed horned lizards.

CUMULATIVE EFFECTS

Cumulative effects are those adverse effects of future non-Federal (State, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project. Effects of past Federal and private actions are considered in the "Environmental Baseline" and the "Status of the Species". Due to the extent of the lands in southwestern Arizona administered by the Bureau of Land Management, Bureau of Reclamation, MCAS - Yuma, Luke Air Force Base, and Organ Pipe Cactus National Monument, many of the actions that are reasonably expected to occur within the vicinity of the project area would be subject to section 7 consultations.

In the United States portion of its range, the Sonoran pronghorn occurs primarily on Federal lands; however, vehicles on Highway 85; and grazing, recreation, and other activities on private lands east of Cabeza Prieta NWR may be adversely affecting Sonoran pronghorn habitat and could be influencing use of the area by pronghorn. Much of the habitat of the flat-tailed horned lizard and Sonoran pronghorn in Sonora, Mexico are within the four million-acre El Pinacate - Gran Desierto - Alto Golfo Biosphere Reserves, a designation that protects this area from many adverse human impacts.

Private and State lands in Arizona supporting flat-tailed horned lizards occur in the vicinity of San Luis, Yuma, the Foothills, and at Hillander-C Irrigation District. Continued development of non-Federal lands for residential, industrial, and agricultural purposes is expected. Development is also occurring south of the border outside of the Biosphere Reserves, particularly on the outskirts of San Luis, Sonora. Flat-tailed horned lizard habitat is being lost to urban development to the west and north of the Goldwater Range, particularly near San Luis, Arizona and San Luis, Sonora, the Foothills, and on the edge of the Yuma Mesa between Yuma and the Foothills.

Other non-Federal proposals that would adversely affect flat-tailed horned lizard habitat in Arizona include a 640-acre landfill, expansion of the Arizona State Prison - Yuma, disposal and development of State lands, agricultural development, and a possible railroad that would cross approximately 15 miles of flat-tailed horned lizard habitat. Non-Federal actions that may result in a take of a listed animal species require a section 10(a)(1)(B) permit from the Service. Cumulative impacts of future State and private projects will be addressed through the section 10(a)(1)(B) permit process.

SUMMARY OF EFFECTS AND CONCLUSION

After reviewing the current status of the flat-tailed horned lizard and the Sonoran pronghorn, the environmental baseline for the action area, the effects of ongoing and proposed military activities, and cumulative effects, it is the Service's biological opinion that proposed and ongoing uses of the Goldwater Range by MCAS - Yuma are not likely to jeopardize the continued existence of either the flat-tailed horned lizard or the Sonoran pronghorn. No critical habitat has been proposed or designated for these species, thus, none will be affected. Our findings of not likely to jeopardy are based on the following:

Sonoran Pronghorn:

1) MCAS - Yuma proposes measures to mitigate, in part, the direct and indirect impacts of the proposed action, including measures to reduce or eliminate direct take of Sonoran pronghorn and to minimize destruction and degradation of habitat.

2) Most ground-based activities proposed by MCAS - Yuma are either outside of the current range of the Sonoran Pronghorn (activities west of the Copper and Cabeza Prieta Mountains) or are in areas that are not intensively used by pronghorn (such as the proposed ground support zones).

3) Virtually no ground-based activities are proposed on the Cabeza Prieta NWR and no ground-based activities would occur within Organ-Pipe Cactus National Monument where the majority of pronghorn localities have been recorded since 1983.

4) Most low-level helicopter and fixed-wing aircraft flights would occur in R-2301W outside of the Cabeza Prieta NWR, in areas where relatively little pronghorn use has occurred since 1983.

5) Although low-level helicopter flights have a potential to elicit various adverse behavioral and physiological responses in Sonoran pronghorn, low-level flights over the Refuge authorized by MCAS would be limited to specific corridors and a maximum of only 10 hours of annual flight time by helicopter groups. During consultation MCAS revised proposed helicopter routes over Cabeza Prieta NWR described in the biological assessment and dEIS to reduce adverse effects to Sonoran pronghorn.

6) In comparison to low-level helicopter flights, low-level fixed-wing aircraft flights probably have a lesser potential to elicit adverse responses from Sonoran pronghorn. On the Refuge, where most pronghorn use occurs, such flights authorized by MCAS would be limited to two corridors and no more than 70 hours per year. In addition, low-level fixed-wing aircraft holding areas over Cabeza Prieta NWR would be deauthorized, reducing the area exposed to low-level flights.

7) Management by MCAS - Yuma and the Bureau of Land Management precludes or limits many activities, such as recreational activity, mining, urban and agricultural development, grazing, landfills, etc., that could potentially eliminate or degrade Sonoran pronghorn habitat.

Flat-tailed Horned Lizard:

1) MCAS - Yuma proposes measures to mitigate, in part, the direct and indirect impacts of the proposed action, including measures to reduce direct take of flat-tailed horned lizards and destruction and degradation of habitat.

2) Ongoing and proposed actions would adversely affect a relatively minor portion of the habitat of the flat-tailed horned lizard on the Goldwater Range in Arizona, and throughout the range of the species.

3) Management by MCAS - Yuma and Bureau of Land Management precludes or limits many activities, such as recreational activity, urban and agricultural development, landfills, and mining that adversely affect habitat elsewhere within the species' range.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act prohibits the take of listed species without special exemption. Taking is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. Incidental take is any take of a listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of sections 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with this incidental take statement.

The prohibitions against taking in section 9 of the Act do not apply to proposed species, such as the flat-tailed horned lizard; however, some of the reasonable and prudent measures listed herein apply specifically to the flat-tailed horned lizard. The Service advises MCAS - Yuma to consider implementing reasonable and prudent measures that address protection of this species. If the species is listed, and if this biological/conference opinion is adopted as a biological opinion for the flat-tailed horned lizard, those measures would become non-discretionary, and would have to be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. Any measures listed herein that do not specifically

address the flat-tailed horned lizard, address the Sonoran pronghorn, and as such are nondiscretionary. MCAS - Yuma has a continuing duty to regulate the activity covered by this incidental take statement. If MCAS - Yuma (1) fails to require any applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

AMOUNT OR EXTENT OF TAKE

This biological opinion anticipates the following forms and amounts of take in regards to the proposed action:

Sonoran Pronghorn:

1) One Sonoran pronghorn per ten years in the form of direct mortality or injury resulting from ordnance delivery by aircraft authorized by MCAS - Yuma, impacts by shrapnel from HAWK missile exercises, collision with MCAS - Yuma military vehicles, or other activities authorized, funded, or carried out by MCAS - Yuma.

2) Undeterminable numbers of Sonoran pronghorn in the form of unintentional harassment of animals by low-flying aircraft authorized by MCAS - Yuma, but only those pronghorn located under low-level fixed-wing and helicopter flight corridors on the Cabeza Prieta NWR during authorized use periods, over R-2301W exclusive of the Refuge, and in R-2301E exclusive of the Refuge during WTI courses.

Flat-tailed Horned Lizard:

1) Twenty flat-tailed horned lizards per year in the form of direct mortality or injury resulting from crushing during operation of vehicles and equipment on and off-road.

2) Three flat-tailed horned lizards per year in the form of direct mortality or injury associated with non-vehicular aspects of troop maneuvers, establishment of camps, EOD disposal, ordnance delivery, use of the rifle range, cargo pallet delivery and recovery at the parachute drop zone, construction at AUX-2, and other non-vehicular activities described in in this biological opinion in "DESCRIPTION OF THE PROPOSED ACTION".

3) Ten flat-tailed horned lizards in the form of harm resulting from loss or degradation of habitat.

4) Undeterminable numbers of flat-tailed horned lizards per year through harassment associated with movement of horned lizards out of harm's way during construction and other activities.

In regards to the Sonoran pronghorn, and in the event that the flat-tailed horned lizard is listed, this biological/conference opinion does not authorize any form of take not incidental to proposed and ongoing activities by MCAS - Yuma on the Goldwater Range as described herein. If the incidental take authorized by this opinion is met, MCAS - Yuma shall immediately notify the Service in writing. If the incidental take authorized by this opinion is exceeded, MCAS - Yuma must immediately reinitiate consultation with the Service to avoid a violation of section 9 of the Act. In the interim, MCAS - Yuma must cease the activity resulting in the take if it is determined that the impact of additional taking will cause an irreversible and adverse impact on the species. MCAS - Yuma should provide to this office an explanation of the cause of the taking.

EFFECT OF THE TAKE

In this biological opinion, the Service finds that this level of anticipated take is not likely to result in jeopardy to either the Sonoran pronghorn or the flat-tailed horned lizard.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the incidental take authorized by this biological/conference opinion:

1. Personnel and visitor education/information programs and well-defined operational procedures shall be implemented.

2. To the extent practicable, military activities shall be located outside of flat-tailed horned lizard and Sonoran pronghorn habitat. Where adverse effects to flat-tailed horned lizards cannot be avoided, the animals shall be moved from harm's way, if possible.

3. MCAS - Yuma shall monitor incidental take resulting from the proposed action and report to the Service the findings of that monitoring.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, MCAS - Yuma must comply with the following terms and conditions. These terms and conditions implement the reasonable and prudent measures described above. In regards to Sonoran pronghorn and in the event that the flat-tailed horned lizard is listed, terms and conditions are nondiscretionary. Terms and conditions or portions thereof that apply to and directly reference the flat-tailed horned lizard, but not the Sonoran pronghorn, are discretionary. For ease of determining whether specific terms and conditions are nondiscretionary, those terms and conditions that apply specifically and only to the flat-tailed horned lizard are identified herein. Terms and conditions 1.b., 1.g., 1.t., 1.u., 2.a., 2.c., 3.a., and 3.b. also contain requirements for the flat-tailed horned lizard that are discretionary. Terms and conditions 1.a. through 1.s., 1.w. through 1.y.; 2.b., and 2.d. through 2.f. are adapted from Dames and Moore (1995), but

may contain slight modifications. Terms and conditions 1.v. and 2.b. were developed at and agreed upon by MCAS - Yuma at a February 22, 1996, meeting of the Sonoran Pronghorn Working Core Group.

1. The following terms and conditions implement reasonable and prudent measure number one:

a. MCAS - Yuma shall designate a management representative and point of contact within the Range Management Department with the duty to ensure compliance with mitigation measures by all military and non-military users of the Goldwater Range. This representative shall have the authority to halt activities that may be in violation of such measures. A single point of contact shall be designated to receive and investigate reports of unauthorized use of the airspace and ground training areas on the Range. MCAS - Yuma shall continue to provide a point of contact within the Range Management Department for addressing concerns expressed by the Service, Bureau of Land Management, Arizona Game and Fish Department, or others about overflights.

b. All users of airspace and lands under R-2301W authorized by MCAS - Yuma, including military and non-military personnel, shall be briefed on federally-listed and proposed threatened and endangered species that may be encountered. Users shall be informed of regulations and protective measures for the Sonoran pronghorn and the flat-tailed horned lizard by way of an education program consisting of a video, a presentation, and/or a pamphlet. The program shall address: 1) the estimated distribution of the flat-tailed horned lizard on the Goldwater Range, 2) the measures to protect flat-tailed horned lizards, Sonoran pronghorn, and their habitats, 3) penalties for disregarding regulations and for violating the Act, and 4) the reporting procedures for flat-tailed horned lizard and Sonoran pronghorn observations. In particular, users of the Range shall be informed of areas to be avoided in order to reduce chance encounters and possible harm to special status species. Aircrews shall be informed of the provisions of the Act concerning harassment of threatened and endangered species. All users of the Range shall be informed that intentional disturbance or harassment of threatened or endangered species is a violation of the Act and could result in prosecution. All military personnel shall be advised that care should be exercised when commuting to and from the project area to reduce mortality of flat-tailed horned lizards on roads.

c. When training outside of ground support areas, small tactical units shall move on foot to off-road training areas, carry out all trash from these locations, and bury human waste on site.

d. Vehicles shall be restricted to designated roads with three exceptions: 1) when operating in designated ground support areas, target areas, or the parachute drop zone, 2) in case of an emergency, such as search and rescue in the case of downed aircraft or lost civilians, and 3) when there is a bona-fide management need, which is limited to

aircraft crash cleanup, access for development of new, approved facilities, natural resource restoration and revegetation work, and other natural resource work where access by road or foot is impossible or impractical. Designated roads shall include only those shown on Figure 1, and existing roads to the EOD operating area and the parachute drop zone.

e. Roads designated for military use and the locations of ground support areas shall be clearly marked with non-obtrusive posts and signs in the field and on maps issued to troops.

f. Vehicles and equipment from which hazardous materials may be spilled or leaked shall be placed over temporary containment aprons of plastic and sandbags. A hazardous materials response plan and team in place at MCAS - Yuma shall respond immediately to any spills at the air station or in the field.

g. In the event of an aircraft crash in Sonoran pronghorn or flat-tailed horned lizard habitat, determination of appropriate site cleanup and restoration procedures shall be coordinated with the Service within 24 hours.

h. MCAS - Yuma shall establish a system for monitoring military compliance with the restrictions for limiting vehicle use to designated roads and ground support areas.

i. MCAS - Yuma shall establish an annual conference with representatives of agencies involved with land and resource management on the Goldwater Range and with interested members of the public. The purposes of the conference shall include reviewing the previous year's training activities, disclosing the military record for compliance with environmental regulations, and receiving input from agencies and the public about YTRC operations and environmental issues.

- 4/00 not being done? or will this the workshop?

j. Actions requiring new surface disturbance shall be limited in areal extent as much as possible and confined to established roadways when feasible.

k. Where new roadways and ground support areas are established, cross- or through-drainages of existing washes (e.g., dip crossings) shall be provided to the extent practical so as to not alter natural drainage or create ponding conditions.

l. All construction work and operational activities shall be planned and completed to minimize increases in the potential for sheet, gully, and rill erosion. All earthwork shall be shaped in a manner that will permit storm runoff with a minimum of erosion. Other measures to minimize erosion may include the construction of temporary and/or permanent berms, dikes, dams, sediment basins, and slope drains.

m. Precautions shall be taken to prevent the pollution of soils and drainageways from discarded materials, sediments, muddy water, or other polluting materials.

n. Vehicle use in passes through mountain ranges shall be limited to the minimum necessary for training. A single road shall be designated for vehicle travel through mountain passes. Other roads in passes should be obscured or at least blocked or posted to ensure closure from use.

o. Storage areas for petroleum products and other chemicals used during construction activities or military operations shall be located or protected so that spills shall not contaminate soils, enter drainageways, or impact ground water. Hazardous or toxic waste generated on site shall be disposed of in a manner consistent with Federal and State guidelines.

p. Human sewage at base camps and other locations of troop concentrations shall be contained and disposed of in a manner that meets all applicable disposal standards.

q. All litter generated by ground troops or other personnel shall be policed and contained daily and shall be carried off the ranges to approved landfill sites. Base camps and other troop concentration areas shall be supported by the placement of commercial dumpsters for litter collection.

r. All discarded matter (including but not limited to human waste, trash, garbage, oil drums, fuel, ashes, equipment, concrete, and chemicals) that is generated by development of and operation of ground support areas shall be removed or disposed of in a manner satisfactory to Federal and State regulations. Ground support areas shall be maintained in a sanitary condition at all times.

s. No ground-based military activities or aircraft flights below 1,500 AGL shall occur on the Cabeza Prieta NWR unless authorized by specific legislation or in accordance with written agreements or MOUs with the Service.

t. MCAS - Yuma shall work with the Bureau of Land Management to develop and implement actions as necessary to curtail unauthorized use of the Range that adversely affects the Sonoran pronghorn or the flat-tailed horned lizard, such as unauthorized off-highway vehicle activity south of the Foothills and in the Mohawk Dunes.

u. Within flat-tailed horned lizard and Sonoran pronghorn habitat, the area of ground disturbance from construction shall be minimized to the maximum extent practicable. The outer boundaries of construction areas shall be clearly flagged or marked to define the limit of work activities. All construction workers shall strictly limit their activities and vehicles to areas which have been flagged to eliminate adverse impacts to flat-tailed horned lizard or Sonoran pronghorn habitat. All workers shall be instructed that their activities are restricted to flagged areas.

v. MCAS - Yuma shall cooperate with Luke Air Force Base and Arizona Game and Fish Department in an evaluation of potential adverse effects to Sonoran pronghorn

from ordnance delivery and unexploded ordnance at target sites on the North and South tactical ranges. Assuming cooperation and authorization from Luke Air Force Base, the evaluation shall, at a minimum, include monitoring of HE Hill and the South tactical range during the fall, 1996 WTI course and other times during 1996 that would be representative of types of disturbance and ordnance delivery that occurs during WTI courses. The duration of the monitoring shall be for at least three months when the HE Hill target area is active and pronghorn are in the area or likely to occur in the area. The results of this evaluation shall be described in a report to be finalized by February, 1997. The report shall include recommendations for mitigating adverse effects to Sonoran pronghorn. In coordination with this office, MCAS - Yuma (and Luke Air Force Base, as appropriate) shall develop these recommendations into mitigation actions that will be promptly implemented. The Service anticipates that mitigation measures could include monitoring target areas for pronghorn immediately before target use, not using specific target areas when pronghorn are present on them, and excluding or discouraging pronghorn use of high risk areas.

not done. w/oo Bio monitors now can it.

<u>Terms and conditions that only apply to the flat-tailed horned lizard and only in flat-tailed horned lizard habitat (Figure 6):</u>

w. All military Goldwater Range users shall be advised to be alert for the presence of flat-tailed horned lizards on roads so as to avoid running over lizards.

x. Signs, gates, or other control measures shall be used at the access road to AUX-2 (County 19th), on Fortuna Road, and other well-used access points to the Goldwater Range west of Gila Mountains to limit use of roads in flat-tailed horned lizard habitat to authorized personnel.

y. MCAS Yuma shall cooperate with the Bureau of Land Management, the Service, Arizona Game and Fish Department, and other participants in the development of a Management Plan for the Yuma Desert and Sand Dunes Habitat Management Area, and the Gran Desierto Dunes ACEC. The plan will establish how flat-tailed horned lizards will be protected on the Range. This may include further development of an education program that details restrictions on certain activities and closing or restricting use of roads within flat-tailed horned lizard habitat.

2. The following terms and conditions implement reasonable and prudent measure number 2:

a. Whenever possible, and given the requirements of the mission or action, MCAS - Yuma shall locate air and ground activities outside of sensitive flat-tailed horned lizard habitat and Sonoran pronghorn habitat. Examples could include using ground-support zone 1 for specific maneuvers, rather than zones 2 or 3 or other ground-support areas within Sonoran pronghorn habitat.

b. Use of two stinger team operating areas, shown in Figure 1, shall be limited to the October-November WTI course to reduce adverse effects to Sonoran pronghorn.

c. Ground-disturbing activities shall occur on previously disturbed sites or, when in flat-tailed horned lizard habitat, on desert pavement, whenever possible.

d. Ground disturbing activities within the Gran Desierto Dunes and Tinajas Altas, and Mohawk Mountains/San Dunes ACECs shall be limited to the maximum extent possible consistent with the training mission.

The following terms and conditions apply only to the flat-tailed horned lizards and only in flat-tailed horned lizard habitat (Figure 6):

e. Two biological monitors (biologists knowledgeable in flat-tailed horned lizard biology and approved by MCAS - Yuma) shall be present within active construction areas throughout the working period each day from initial clearing to construction completion. The biological monitors shall work with the construction supervisor to take steps, as necessary, to avoid disturbance to flat-tailed horned lizards and their habitat. The monitors shall periodically examine (at least hourly) the construction area in order to remove any flat-tailed horned lizards. Deep excavations (if any) shall be inspected for lizards by the biological monitors prior to backfilling. Flat-tailed horned lizards found inside excavations shall be captured by hand and relocated from the construction area into nearby suitable habitat. Monitors shall walk in front of equipment and vehicles to flush or move lizards from the immediate work area and out of harm's way. Biological monitors shall also monitor all project-related activities to ensure compliance with these terms and conditions. Monitors shall have the authority to halt activities not in compliance with these terms and conditions. Handling and relocation of flat-tailed horned lizards shall be in compliance with terms and conditions 2.g and 2.h.

f. The two western-most proposed ground support areas shall be located in areas of low habitat value for flat-tailed horned lizard. Appropriate sites shall be determined after considering alternate sites for each area and surveying all sites for flat-tailed horned lizards. Surveys shall be consistent with protocols set forth in the Flat-tailed Horned Lizard Management Strategy (when finalized) or in subsequent protocols developed by research at the Goldwater Range or elsewhere and adopted by the Service.

g. All handling of flat-tailed horned lizards shall be in compliance with all State and Federal law, including necessary authorization from Arizona Game and Fish Department. If the species is listed, only biologists authorized by both Arizona Game and Fish Department and the Service under the auspices of this opinion shall be permitted to handle flat-tailed horned lizards. If the species is listed, the names(s) and

credentials of proposed authorized biologists shall be submitted to the Service for review and approval at least 15 days prior to the onset of any construction activities.

h. Relocated flat-tailed horned lizards shall be placed in the shade of a large shrub that is a short distance from the construction zone and in the direction of undisturbed habitat. If surface temperatures in the sun are less than 30° C or exceed 50° C, the authorized biologist shall hold the flat-tailed horned lizard for later release. Initially, captured flat-tailed horned lizards shall be held in a cloth bag, cooler, or other appropriate clean, dry container from which the lizard cannot escape. Lizards shall be held at temperatures between 25 and 35° C and shall not be exposed to direct sunlight. Release shall occur as soon as possible after capture and during daylight hours when surface temperatures range from 32 to 40° C. If such conditions do not occur within 48 hours of capture, the lizard(s) shall be transferred to a terrarium containing at least 2 inches of sand from the project area. The terrarium shall be maintained at 10 to 20° C until conditions at the site are appropriate for release. Lizards shall be allowed to acclimate to higher surface temperatures prior to release. The authorized biologist shall be allowed some judgement and discretion to ensure that survival of flat-tailed horned lizards found in the project area is likely.

i. The run-in line to the Cactus West target shall not be graded and shall not be used as a designated route.

3. The following terms and conditions implement reasonable and prudent measure number 4.

a. MCAS - Yuma shall submit an annual monitoring report to the Arizona Ecological Services State Office and the Cabeza Prieta NWR by January 1 of each year, beginning in 1997. The report shall be brief and in letter form and include the actual acres of flat-tailed horned lizard and Sonoran pronghorn habitat disturbed, numbers and locations of flat-tailed horned lizards and Sonoran pronghorn encountered, and numbers of flat-tailed horned lizards and Sonoran pronghorn killed, injured, moved, or otherwise taken as a result of activities authorized by this opinion (notification and reporting of dead, injured, or sick listed species shall also conform to requirements in the section entitled "DISPOSITION OF DEAD, INJURED OR SICK INDIVIDUALS OF LISTED SPECIES"). The report shall also make recommendations for modifying or refining the terms and conditions stipulated herein to enhance protection of listed or proposed species or to reduce needless hardship on MCAS - Yuma.

b. Anticipated take limits that would require reinitiation are addressed in "AMOUNT OR EXTENT OF TAKE" and are based on implementation of the proposed action without these terms and conditions. With implementation of terms and conditions the Service believes that no more than one Sonoran pronghorn in the form of direct mortality or injury, an undeterminable number of Sonoran pronghorn under low-level flight corridors and areas in the form of harassment, no more than ten flat-tailed

horned lizards per year resulting from direct mortality, eight flat-tailed horned lizards per year in the form of harm, and an undeterminable number of flat-tailed horned lizards per year in the form of harassment will be incidentally taken. If, during the course of the proposed action, this minimized level of incidental take is exceeded, such incidental take would represent new information requiring review of the reasonable and prudent measures. MCAS - Yuma must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

DISPOSITION OF DEAD, INJURED, OR SICK INDIVIDUALS OF LISTED SPECIES

Upon locating a dead, injured, or sick individual of a listed species, initial notification must be made to the Service's Law Enforcement Office, Federal Building, Room 8, 26 North McDonald, Mesa, Arizona, (Telephone: 602/261-6443) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to the Phoenix Field Office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible state. If possible, the remains of listed species shall be placed with educational or research institutions holding appropriate State and Federal permits. If such institutions are not available, the information noted above shall be obtained and the carcass left in place.

Arrangements regarding proper disposition of potential museum specimens shall be made with the institution prior to implementation of the action. Injured animals should be transported to a qualified veterinarian by an authorized biologist. Should any treated listed animals survive, the Service shall determine its final disposition.

CONCURRENCES

Cactus ferruginous pygmy-owl:

Cactus ferruginous pygmy-owls are known to occur in riparian cottonwood forests and mesquite bosques, as well as in Sonoran desertscrub associations of palo verde, bursage, and large columnar cacti such as saguaro and organ pipe cactus, *Stenocereus thurberi*. Unifying habitat characteristics among these communities are fairly dense woody thickets or woodlands with trees and/or cacti large enough to provide nesting cavities. This type of habitat is often found along desert washes or on bajadas. None of the proposed critical habitat delineated for the pygmy-owl occurs within the Goldwater Range boundaries.

The Goldwater Range overlaps portions of the historic range. In addition, there is an historic record of a pygmy-owl from the Goldwater Range. Surveys were conducted at the Bryan Mountain/Monreal Well, the Agua Dulce Mountains, and Growler Peak on the Cabeza Prieta National Wildlife Refuge in 1993 and 1994. No pygmy-owls were detected.

Unconfirmed detections of pygmy-owls were reported from the Johnson Well area of the Sand Tank Mountains in 1992 and 1994 (U.S. Army Corps of Engineers 1995; Tim Tibbitts, Organ Pipe Cactus National Monument, pers. comm. 1994), and from the East Tactical Range in 1995 (Bob Barry, pers. comm. 1995). While there are no confirmed current records for pygmy-owl within its boundaries, the Goldwater Range does overlap historic habitat and, based on information provided in Dames and Moore (1995), contains potentially suitable habitat for pygmy-owls.

50 CFR 402.10(a) requires Federal agencies to confer with the Service on actions that are likely to jeopardize the continued existence of species proposed for listing as endangered or threatened. The Marine Corps has determined that the proposed project is "...unlikely to affect and will not jeopardize the continued existence of the species...". The proposed project is within historic range for the pygmy-owl, and suitable habitat may exist within the proposed project area. In addition, the Service believes that some of the actions proposed may affect the pygmy-owl. For these reasons, the Service concurs with the finding of MCAS - Yuma that the project is not likely to jeopardize the continued existence of the pygmy-owl **subject to the following conditions**:

1. No later than January 1, 1997, a survey for pygmy-owls is initiated in areas east or north and east of the Cabeza Prieta Mountains under airspace 2301W north of the Cabeza Prieta NWR and in flight corridors and areas of 2301E used during WTI courses in which there would be an overlap of low-level (less than 200 feet AGL) fixed-wing aircraft or helicopter flights and suitable habitat during the breeding season (January through April). Surveys of low-level flight corridors on Cabeza Prieta NWR should include all suitable habitat in the corridors and one mile on either side of the corridors. Areas of suitable habitat shall be determined in coordination with this office, Cabeza Prieta NWR, the Bureau of Land Management, and Arizona Game and Fish Department. A general description of suitable habitat is provided above. Surveys shall be conducted following guidelines developed by the Arizona Game and Fish Department (see enclosure). It is anticipated that this survey effort could be completed in two years, however, this period may need to be adjusted following determination of the total area needing to be surveyed.

   Should pygmy-owls be detected within the flight corridors, flights occurring during the breeding season of January through April would need to be re-routed to adjacent corridors or flight elevation increased to above 200 feet AGL within one mile of the detection site. This should affect only the helicopter flights occurring during the spring WTI course as the fall WTI course does not coincide with the breeding season for pygmy-owls. Dames and Moore (1995) note that on occasion WTI students selected only northern routings in response to some course battle scenarios. The Service would recommend that a contingency plan be developed in order to allow for re-routing or increasing elevation of flights above 200 feet AGL during the spring WTI course in the event that a pygmy-owl is detected.

Should pygmy-owls be detected north of Cabeza Prieta NWR, where low-level flights occur without designated flight corridors, an exclusion zone with a radius of one mile around the detection site shall be established. Flights shall either be routed around the exclusion zone in the January through April breeding season or aircraft shall fly above 200 feet AGL within one mile of the detection site. The Service should be contacted within 72 hours of identification of pygmy-owls within the proposed project area. Any detection of pygmy-owls would trigger reinitiation of this conference.

2. Surveys for pygmy-owls are conducted where suitable habitat is present in the proposed ground support area southwest of the closed Stoval airfield. Should any pygmy-owls be identified in the proposed ground support area, construction of this new ground support area will not proceed until the Service has been contacted. The Service should be contacted within 72 hours of identification of pygmy-owls within the proposed ground support area. Detection of pygmy-owls would trigger reinitiation of this conference.

Lesser long-nosed bat:

The lesser long-nosed bat (bat) was listed (originally, as Sanborn's long-nosed bat) as endangered on September 30, 1988 (53 FR 38456). No critical habitat has been designated for this species. The lesser long-nosed bat is a small leaf-nosed bat. It has a long muzzle and a long tongue. These features are adaptations to collect nectar from the flowers of columnar cactus, such as the saguaro and organ pipe, and from paniculate agaves (Hoffmeister, 1986). This migratory species is found throughout its historic range from southern Arizona, through western Mexico, and south to El Salvador. It occurs in southern Arizona from the Picacho Mountains southwest to the Agua Dulce Mountains and southeast to the Chiricahua Mountains and south to Mexico. Arizona roosts are occupied from late April to September (Cockrum, 1991). Adult females, most of which are pregnant, and their recent young are the first to arrive, and they form maternity colonies at lower elevations near concentrations of flowering columnar cacti. After the young are weaned, these colonies disband in July and August; some females and young move to higher elevations, primarily in the southeastern parts of Arizona near concentrations of blooming paniculate agaves. Adult males are known mostly from the Chiricahua Mountains but also occur with adult females and young of the year at maternity sites (Fleming, 1994).

Loss of roost and foraging habitat, as well as direct taking of individual bats during animal control programs, particularly in Mexico, have contributed to the current status of the species. Suitable day roosts and suitable concentrations of food plants, are the two resources that are critical for the lesser long-nosed bat (Fleming, 1994). As indicated above, the lesser long-nosed bat consumes nectar and pollen of paniculate *Agave* flowers and the nectar, pollen, and fruit produced by a variety of columnar cacti. Caves and mines are used as day roosts. The factors that make roost sites usable have not yet been identified; narrow or specialized requirements may not be necessary for day roosts. Whatever the factors are that determine selection of roost locations, the species appears to

be sensitive to human disturbance. Instances are known where a single brief visit is sufficient to cause a high proportion of lesser long-nosed bats to temporarily abandon their day roost and move to another. Perhaps most disturbed bats return to their preferred roost in a few days. However, the sensitivity suggests that the presence of alternate roost sites may be critical when human disturbance occurs. Interspecific interactions with other bat species may also influence lesser long-nosed bat roost requirements.

Known major roost sites include 16 large roosts in Arizona and Mexico (Fleming, 1994). According to surveys conducted in 1992 and 1993, the number of bats estimated to occupy these sites was greater than 200,000. Twelve major maternity roost sites are known for Arizona and Mexico. According to the same surveys, the maternity roosts are occupied by over 150,000 lesser long-nosed bats. The numbers above indicate that although there may be relatively large numbers of these bats known to exist, the relative number of known large roosts is small. Disturbance of these roosts and the food plants associated with them could lead to the loss of the roosts. The limited numbers of maternity roosts may be the critical factor in the survival of this species.

The project area is primarily west of what is considered to be the known range of the lesser long-nosed bat. However, the range delineation is based on roost records and roosts of lesser long-nosed bats may be difficult to find. Lesser long-nosed bats can travel up to 30 miles from their day roost while foraging. The project area contains potential foraging habitat of the bat, and the project area may occur within the foraging range of the bat. The closest records of lesser long-nosed bats to the project area are maternity colonies in the Growler and Slate Mountains and roosts in the Agua Dulce Mountains within Cabeza Prieta National Wildlife Refuge (Dames and Moore, 1995). The maternity roosts are within foraging distance of the ground-based activities (the ground-disturbing activities on the tactical ranges) associated with this project (see Figure 3). Potential roosts of the Goldwater Range were surveyed in 1994 (Dalton and Dalton, 1994). No lesser long-nosed bats or their potential roosts were found, with the exception of one possible transitory shelter. Potential roosts on Cabeza Prieta National Wildlife Refuge have been surveyed to a lesser extent resulting in the discovery of the roosts in the Agua Dulce Mountains. No ground-disturbing activities will occur on the Refuge as a result of this project. The WTI routes on the Refuge appear to be far enough from the known roost sites to preclude any disturbance of those roosts from noise or vibrations associated with overflights. During consultation, the Service expressed concern that a proposed low-level helicopter corridor through the southern end of the Growler Mountains could cause disturbance to a nearby maternity roost in that mountain range. In response to this concern, MCAS eliminated the route and created route 3g (Figure 4). The effect of overflights and low-level routes on foraging bats is largely unknown. The Service is not aware of future State, local or private actions that are reasonably certain to occur in the action area.

It is not clear what the vegetation of the tactical ranges consists of. but the Service assumes it contains foraging habitat for the lesser long-nosed bat. The ranges are probably within the foraging distance of at least two known maternity roosts. Activities associated with this project will ultimately arrive at and deliver ordnance to the tactical ranges (at least to the North and South ranges; use of East tactical range is unclear). The Service understands that use of the tactical ranges for delivery of ordnance is restricted to specific targets (Gary Blake, personal communication). Such targets have been in use for long periods of time and much of the vegetation at the target areas has already been impacted. The locations of the target areas remain the same and are not changed on the tactical ranges. The targets are estimated to represent three percent of the area of the tactical ranges. No random deliverance of ordnance, including strafing, occurs on the tactical ranges. Therefore, no additional potential lesser long-nosed bat foraging habitat is likely to be affected by the activities of MCAS - Yuma. Thus, based on the above consideration, the Service concurs with the apparent finding by MCAS - Yuma that the project may affect, but is not likely to adversely affect, the lesser long-nosed bat.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed or proposed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed or proposed species or critical habitat, to help implement recovery plans, or to develop information on listed or proposed species. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1) responsibilities for the Sonoran pronghorn or the flat-tailed horned lizard. In furtherance of the purposes of the Act, we recommend implementing the following actions:

1. MCAS - Yuma should continue to fund and support basic research, inventory, and monitoring of the Sonoran pronghorn. In particular, MCAS - Yuma should investigate the effects of low-level helicopter and fixed-wing aircraft flights over the Goldwater Range and Cabeza Prieta NWR and ground-based military activities on the behavior and physiology of the Sonoran pronghorn.

2. MCAS - Yuma should continue to fund and support research on the flat-tailed horned lizard that will contribute to improved management for the species and its habitat. In particular, MCAS - Yuma should continue to support, fund, and encourage research on development of a cost-effective survey technique, determination of flat-tailed horned lizard demographics, and quantify human-caused effects, such as aircraft noise, off-highway vehicles, fire, non-native plants, etc., on the flat-tailed horned lizard.

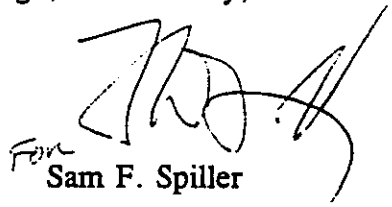
3. MCAS - Yuma should continue to participate in the preparation of a Rangewide Management Strategy and conservation agreement for the flat-tailed horned lizard and should implement the Strategy and agreement upon their completion.

4. MCAS - Yuma should map contours of noise levels resulting from military aircraft flights over the Cabeza Prieta NWR. This map should be provided to Cabeza Prieta NWR for analysis of the effects of aircraft noise on pronghorn habitat use.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed or proposed species or their habitat, the Service requests notification of the implementation of any conservation recommendations.

CLOSING STATEMENT

This concludes formal consultation on use of the Arizona portion of the YTRC by the Marine Corps. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may adversely affect listed species or critical habitat in a manner or to an extent not considered in this opinion; 3) the agency action is subsequently modified in a manner that causes an effect to a listed species or critical habitat that was not considered in this opinion; or 4) a new species is listed or critical habitat designated that may be affected by this action. In instances where the amount or extent of anticipated incidental take (page 52) is exceeded, MCAS - Yuma must immediately reinitiate consultation and the activity resulting in take must cease if it is determined that the impact of additional taking will cause an irreversible and adverse impact on the species. Any questions or comments should be directed to Jim Rorabaugh, Ted Cordery, or Bruce Palmer of my staff.



For Sam F. Spiller

Enclosure

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM
(GM:GSV/LCR)(AES)
Field Supervisor, Fish and Wildlife Service, Carlsbad, CA
Refuge Manager, Cabeza Prieta National Wildlife Refuge, Ajo, AZ
Bill Fisher, United States Navy, Southwest Division, San Diego, CA

State Director, Bureau of Land Management, Phoenix, AZ
Larry Voyles, Arizona Game and Fish Department, Yuma, AZ
Director, Arizona Game and Fish Department, Phoenix, AZ
Area Manager, Yuma Resource Area, Yuma, AZ
Larry Foreman, Bureau of Land Management, California Desert District, Riverside, CA
Bruce Eilerts, Environmental Program, Luke Air Force Base, AZ
Park Superintendent, Organ Pipe Cactus National Monument, Ajo, AZ
Linwood Smith, Dames and Moore, Tucson, AZ

LITERATURE CITED

Arizona Game and Fish Department. 1981. The Sonoran pronghorn. Special Report #10. Project W-53-R., Work Plan 1, Job 1. Arizona Game and Fish Department, Phoenix, AZ.

Berger, J., D. Daneke, J. Johnson, and S. Berwick. 1983. Pronghorn foraging economy and predator avoidance in a desert ecosystem: Implications for the conservation of large mammalian herbivores. Biological Conservation 25:193-208.

Bleich, V.C., R.T. Bowyer, A.M. Pauli, R.L. Vernoy, and R.W. Anthes. 1990. Responses of mountain sheep to helicopter surveys. California Fish and Game 76:197-204.

Bolster, B., and K. Nicol. 1989. The status of the flat-tailed horned lizard (*Phrynosoma mcallii*) in California. Report to the California Fish and Game Commission, Sacramento, CA.

Brattstrom, B.H. 1965. Body temperatures of reptiles. American Midland Naturalist 73(2):376-422.

Brattstrom, B.H., and M.C. Bondello. 1980. Biological impacts of noise in the desert. In: J. Latting (ed), The California Desert: An Introduction to Natural Resources and Man's Impact. California Native Plant Society, Riverside, CA.

Brooks, M. 1995. Alien annual grass distribution, abundance and impact on desert tortoise habitat in the western Mojave Desert, annual report - 1995. Report to the Bureau of Land Management, Riverside, CA.

Brooks, M.L. 1992. Ecological impact of human disturbance on the Desert Tortoise Natural Area, Kern County, California, 1978-1992. Masters Thesis, California State University, Fresno, CA.

Bureau of Land Management. 1990. Management strategy for the flat-tailed horned lizard (*Phrynosoma mcallii*) on Bureau of Land Management administered lands in the California Desert Conservation Area. Bureau of Land Management, Riverside, CA.

Carr, J.N. 1970. Endangered species investigation. Sonoran Pronghorn. Arizona Game and Fish Department, Phoenix, AZ.

Cockrum, E.L. 1981. Taxonomy of the Sonoran pronghorn. Pages 2-10 In: The Sonoran Pronghorn. Special Report #10. Arizona Game and Fish Department, Phoenix, AZ.

Dames and Moore. 1995. Biological assessment for the Marine Corps Use of the Barry M. Goldwater Range, Arizona. Report to Marine Corps Air Station, Yuma, AZ.

deVos, J.C. 1989. Evaluation of Sonoran pronghorn movements around military activity sites on the Barry M. Goldwater Air Force Range. Report to Luke Air Force Base, Arizona.

deVos, J.C. 1990. Selected aspects of Sonoran pronghorn research in Arizona and Mexico. Pages 46-52 In P.R. Krausman and N.S. Smith (eds), Proceedings of the Symposium: Managing Wildlife in the Southwest. Tucson, AZ.

deVos, J.C. 1995. Population simulation for the endangered Sonoran pronghorn. Arizona Game and Fish Department, Phoenix, AZ.

Duncan, R.B., T.C. Esque, and K.L. Echols. 1994. *Phrynosoma mcallii* (flat-tailed horned lizard) predation. Herpetological Review 25(2):68.

Edwards, C. 1979. A report on the distribution, abundance, population trends and habitat requirements for the flat-tailed horned lizard on the lower Colorado River. Report to the Arizona Game and Fish Department, Phoenix, AZ.

Edwards, C.L., and R.D. Ohmart. 1981. Food habits of the Sonoran pronghorn. Pages 34-44 In: The Sonoran Pronghorn. Special Report #10. Arizona Game and Fish Department, Phoenix.

Fish and Wildlife Service. 1982. Sonoran pronghorn recovery plan. U.S. Fish and Wildlife Service, Region 2, Albuquerque, NM.

Fish and Wildlife Service. 1993. Endangered and threatened wildlife and plants; proposed rule to list the flat-tailed horned lizard as threatened. Federal Register 58(227):62624-62629.

Fish and Wildlife Service. 1994a. Sonoran pronghorn recovery plan revision (*Antilocapra americana sonoriensis*). Technical/agency draft. Fish and Wildlife Service, Region 2, Albuquerque, NM.

Fish and Wildlife Service. 1994b. Desert Tortoise (Mojave Population) Recovery Plan. Fish and Wildlife Service, Portland, Oregon.

Freddy, D.J., W.M. Bronaugh, and M.C. Fowler. 1986. Responses of mule deer to disturbance by persons afoot and snowmobiles. Wildlife Society Bulletin 14:63-68.

Geist, V. 1971. A behavioral approach to the management of wild ungulates. Pages 413-424 In: E. Duffey and A.S. Watts (eds), The Scientific Management of Animal and Plant Communities for Conservation. Symposium of the British Ecological Society #11. Blackwell Science Publications, Oxford, U.K.

Geist, V. 1978. Behavior. Pages 283-296 In: L.L. Schmidt and D.L. Gilbert (eds), Big Game in North America. Stackpole Books, Harrisburg, PA.

Goldman, E.A. 1945. A new pronghorn from Sonora. Proceedings of the Biological Society, Washington 58:3-4.

Hall, E.R., and K.R. Kelson. 1959. The Mammals of North America. Ronald Press, New York.

Harris, J.D. 1943. Habituary response decrement in the intact organism. Psychology Bulletin 40:385-422.

Hodges, W.L. 1995. *Phrynosoma mcallii* occurrence in Arizona. Department of Zoology, University of Texas at Austin. Report to Arizona Game and Fish Department, Phoenix. Contract Q95-15-K.

Hoffmeister, D.F. 1986. Mammals of Arizona. University of Arizona Press, Tucson, AZ.

Howard, C.W. 1974. Comparative reproductive ecology of horned lizards (Genus *Phrynosoma*) in southwestern United States and northern Mexico. J. Ariz. Acad. of Sci. 9:108-116.

Hughes, K.S. 1991. Sonoran pronghorn use of habitat in Southwest Arizona. M.S. Thesis, University of Arizona, Tucson, AZ.

Hughes, K.S., and N.S. Smith. 1990. Sonoran pronghorn use of habitat in Southwest Arizona. Report to Cabeza Prieta National Wildlife Refuge, Ajo, AZ.

Johnson, T.B., and R.B. Spicer. 1985. Status Report: *Phrynosoma mcallii* (Hallowell 1852). Prepared for Office of Endangered Species, U.S. Fish and Wildlife Service, Albuquerque, New Mexico. Contract No. 14-16-0002-81-224. 57 pages.

Kitchen, D.W., and B.W. O'Gara. 1982. Pronghorn (*Antilocapra americana*). Wild Mammals of North America. Oregon General Technical Report PNW-145.

Krausman, P.R., and J.J. Hervert. 1983. Mountain sheep responses to aerial surveys. Wildlife Society Bulletin 11:372-375.

Krausman, P.R., B.D. Leopold, and D.L. Scarbrough. 1986. Desert mule deer response to aircraft. Wildlife Society Bulletin 14:68-70.

Luz, G.A., and J.B. Smith. 1976. Reactions of pronghorn antelope to helicopter overflight. Journal of Acoustical Society of America 59(6):1514-1515.

MacArthur, R.A., R.H. Johnston, and V. Geist. 1979. Factors influencing heart rate in free-ranging bighorn sheep: a physiological approach to the study of wildlife harassment. Canadian Journal of Zoology 57:2010-2021.

Marine Corps Air Station - Yuma. 1995. Yuma Training Range Complex, Environmental Impact Statement. U.S. Department of Defense, Marine Corps Air Station, Yuma, AZ.

Mayhew, W.W. 1965. Hibernation in the horned lizard, *Phrynosoma mcallii*. Comp. Biochem. Physiol. 16:103-119.

Mearns, E.A. 1907. Mammals of the Mexican boundary of the United States, Part 1. Bulletin of the U.S. National Museum 56:XVT530.

Minnich, R.A. 1994. Postfire succession in desertscrub communities of Southern California. In: A. Fletcher-Jones (ed.), Proceedings of the Symposium of the 1994 Desert Tortoise Council. Desert Tortoise Council, Inc., San Bernardino, CA.

Moen, A.N., S. Whittemore, and B. Buxton. 1982. Effects of disturbance by snowmobiles on heart rate of captive white-tailed deer. New York Fish and Game Journal 29:176-183.

Monson, G. 1968. The desert pronghorn. Pages 63-69 In: Desert Bighorn Council Transactions, Las Vegas, NV.

Muth, A., and M. Fisher. 1992. Development of baseline data and procedures for monitoring populations of the flat-tailed horned lizard, *Phrynosoma mcallii*. Report to the California Department of Fish and Game, Sacramento, California.

Norris, K.S. 1949. Observations on the habits of the horned lizard *Phrynosoma mcallii*. Copeia, 1949(3):176-180

Parker, W.S. and E.R. Pianka. 1975. Ecology of horned lizards: a review with special reference to *Phrynosoma platyrhinos*. Copeia 1975:141-162.

Reichenbacher, F.W., and R.B. Duncan. 1989. Sanborn's bat and rare plant studies at Barry M. Goldwater Bombing Range, Yuma County, AZ. Final Report, F.W. Reichenbacher & Associates, Tucson, AZ.

Rorabaugh, J. 1994. An analysis of scat counts as a survey method for the flat-tailed horned lizard (*Phrynosoma mcallii*). Report to the Fish and Wildlife Service, Phoenix, Arizona.

Rorabaugh, J.C., C.L. Palermo, and S.C. Dunn. 1987. Distribution and relative abundance of the flat-tailed horned lizard (*Phrynosoma mcallii*) in Arizona. Southwestern Naturalist 32(1):103-109

Snow T.K. 1994. Sonoran pronghorn aerial survey summary 1992-1994. Nongame and Endangered Wildlife Program Technical Report 51. Arizona Game and Fish Department, Phoenix, AZ.

Stockwell, C.A., and G.C. Bateman. 1987. The impact of helicopter overflights on the foraging behavior of desert bighorn sheep (*Ovis canadensis nelsoni*) at Grand Canyon National Park. Report to the National Park Service.

Turner, F.B., and P.A. Medica. 1982. The distribution and abundance of the flat-tailed horned lizard (*Phrynosoma mcallii*). Copeia 1984(4):815-823.

Turner, F.B., J.C. Rorabaugh, E.C. Nelson, and M.C. Jorgensen. 1980. A survey of the occurrence and abundance of the flat-tailed horned lizard (*Phrynosoma mcallii*) in California. Contract YA-512-CT8-58. 52 pages.

Turner, R.M. and D.E. Brown. 1982. Sonoran desertscrub. In: D.E. Brown (ed.). Biotic communities of the American Southwest-United States and Mexico. Desert Plants 4(1-4):181-222.

United States Army Corps of Engineers. 1995. Administrative Draft Environmental Impact Statement, Western Army National Guard Aviation Training Site Expansion. Prepared for the National Guard Bureau and Arizona National Guard, U.S. Army Corps of Engineers, Los Angeles District.

University of Arizona. 1986. Natural Resources Management Plan for Luke Air Force Range: Executive Summary. Report to U.S. Air Force-Tactical Air Command, Luke Air Force Base, Arizona.

Vasek, F.C., H.B. Johnson, and G.D. Brum. 1975a. Effects of power transmission lines on vegetation of the Mojave Desert. Madrono 23(3):114-130.

Vasek, F.C., H.B. Johnson, and D.H. Eslinger. 1975b. Effects of pipeline construction on creosote bush scrub vegetation of the Mojave Desert. Madrono 23(1):1-13.

Weisenberger, M.E., P.R. Krausman, M.C. Wallace, D.W. DeYoung, and O.E. Maughan. 1996. Effects of simulated jet aircraft noise on heart rate and behavior of desert ungulates. Journal of Wildlife Management 80(1):52-61.

Wells, P.V. 1961. Succession in desert vegetation on streets of a Nevada ghost town. Science 134:670-671

Workman, G.D., T.D. Bunch, J.W. Call, F.C. Evans, L.S. Neilson, and E.M. Rawlings. 1992. Sonic boom and other disturbance impacts on pronghorn antelope (*Antilocapra americana*). Report to the U.S. Air Force, Hill Air Force Base, Utah.

Wright, R.L. and J.C. deVos. 1986. Final report on Sonoran pronghorn status in Arizona. Contract No. F0260483MS143, Arizona Game and Fish Department, Phoenix, AZ